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"Circulated Everywhere Dyestuffs Are Used"

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

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Charts for the Dyehouse

A Quick, Accurate Method for Working Out Formulas by Means of Charts Which Give Amount of Dye Corresponding to a Given Per Cent, or Per Cent Corresponding to a Given Amount of Dye, Without Calculation—Suggestions for Further Applications, and Construction of Charts

By CHARLES F. GOLDTHWAIT and JOHN E. HOFF

Chemists, Klearflax Linen Rug Company

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THIS is the day of charts and graphs. We use them for everything from recording the weight of the baby to following world markets, so why not adapt a few to the dyehouse? Here are some suggestions which can be used, no doubt, "as is" for many purposes, or with a few simple changes can find still wider application.

Tables for the determination of amounts of dye corresponding to percentages or various weights of stock are common but usually require some figuring to arrive at the desired result. Long-hand calculation is no doubt more common, more subject to error, and takes longer. These charts replace both in a much simpler way and not only show the amount of dye corresponding to a given per cent but are reversible and will show at once the per cent that corresponds to a given amount of dye.

Figure 1 will illustrate the method. Having given any amount of stock that is indicated on the left-hand side, and any per cent that appears on the middle scale, the amount of color in pounds and ounces can be read at once from the right-hand scale if a straight edge is laid across the two given points. It intersects the third line at the required amount. For example, we scale from 260 pounds of stock through 3½ per cent and get 9 pounds 1 ounce. Calculation gives 9.1 pounds, so our result is close enough for all practical purposes, considering the amount and depth of shade.

As a second example, assume that we have a dye formula given in pounds of color for a given number of pounds of stock. Scaling between these two figures will give at once the per cent of dye. From this we can use the same chart to get a new formula for any other quantity of stock within its range.

We can even conceive a third case where we have a standard formula which can be expressed in percentages, and have only a limited amount of dye. By merely scaling through the known points we can find just what weight of goods can be colored with our odd lot.

The first three charts shown, cover dyeings on lots of stock up to 400 pounds with sufficient accuracy for ordinary work. There are two sets of figures on the first two:

Chart	Range: Pounds of Stock	Reads Directly	Closely Estimated to
1	200-400	2 oz. dye	1/2 oz. dye
1	100-200	1 oz. dye	1/4 oz. dye
2	50-100	1/2 oz. dye	1/8 oz. dye
2	25- 50	1/4 oz. dye	1/16 oz. dye
3	0- 32	1/4 oz. dye	1/16 oz. dye

If these particular charts do not happen to answer the specific requirements, more suitable charts can easily be made by varying the size, shape and graduations. While they will require some study, they are not difficult to design when once understood. Some of the possibilities follow:

Greater accuracy for specific purposes can be obtained by decreasing the range of each single chart.

Higher percentages can be covered by developing the per cent line to any desired length.

Either decimals or common fractions of per cents can be used.

Amounts of dyestuffs can be indicated as ounces and fractions of ounces, by the better system of decimals of a pound, or in metric units.

Any large amounts of stock, yarn or piece goods can be easily covered.

This same style of chart also has been used extensively by the writers for determining per cent of moisture or regain in textiles, determining weight per square yard of

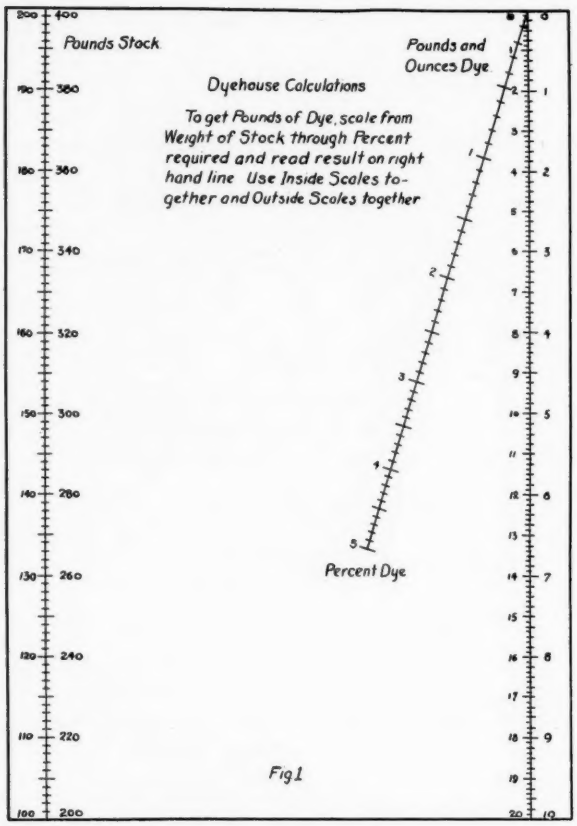
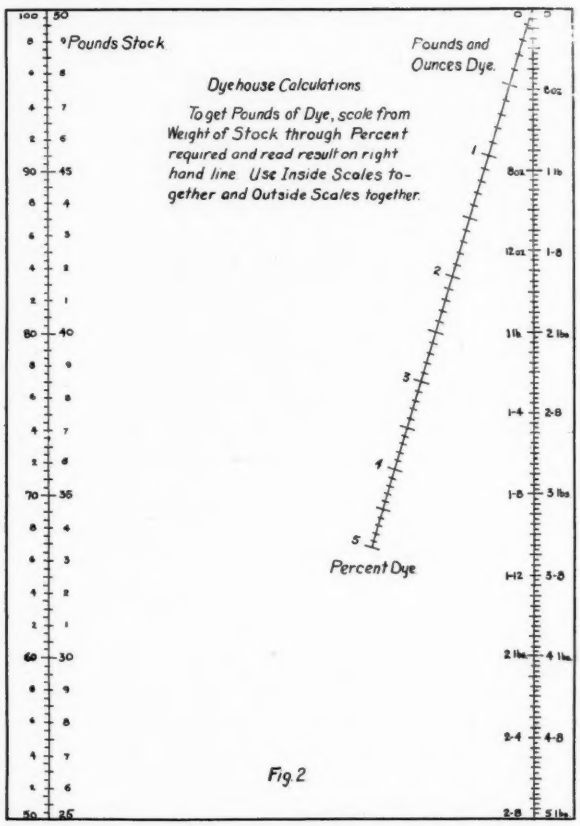

Pounds Stock
Pounds and Ounces Dye
Dyehouse Calculations
To get Pounds of Dye, scale from Weight of Stock through Percent required and read result on right hand line Use Inside Scales together and Outside Scales together
Percent Dye

Fig. 1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Percent Dye

Fig. 2

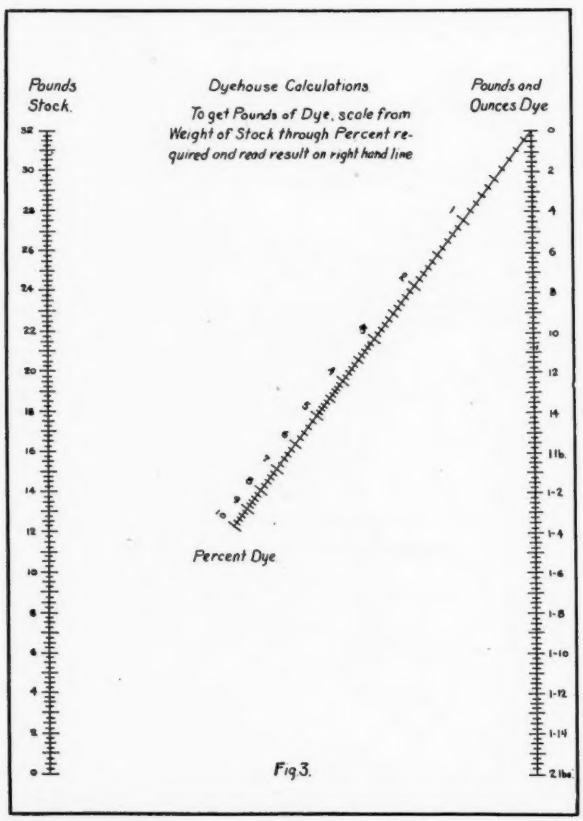
Pounds Stock.
Dyehouse Calculations
To get Pounds of Dye, scale from Weight of Stock through Percent required and read result on right hand line
Pounds and Ounces Dye
Percent Dye

Fig. 3.

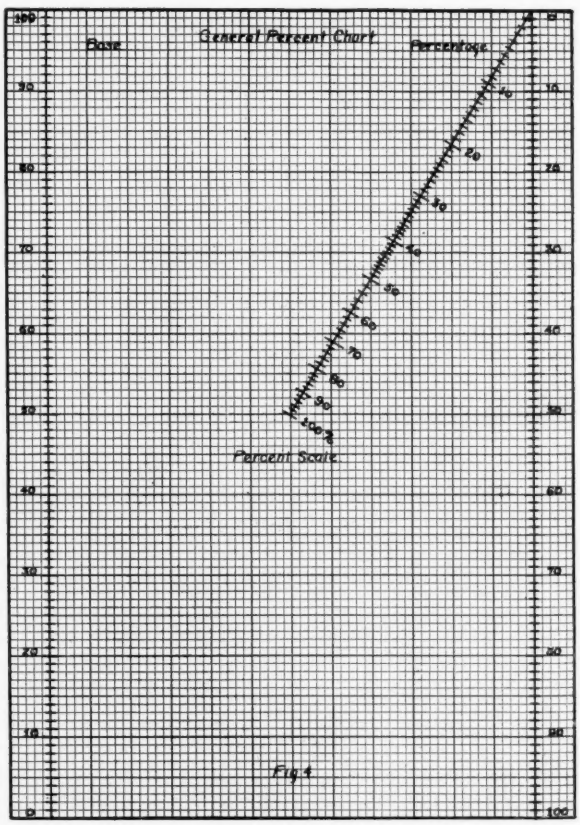

Fig. 4

piece or roll goods, and for routine laboratory calculations. Charts for such purposes can easily be made, and much time saved by the use of them in certain types of routine work. Several such applications and a more detailed explanation of the "theory" of this type of chart were given by one of the writers in "Textile World" for December 31, 1921. The working principle is the same as for dyes, and without going into too much detail it may be said that the chart depends on the geometrical principle of similar triangles. A very general type is here shown as *Figure* 4, and the method of drawing a line from any place on the right to any number on the left, such that the line crosses the third scale, indicates at once on the third scale the per cent that the first number is of the second. This fact can be verified for any number of points.

Any two parallel lines will serve as the sides of the chart; graduate them in equal divisions but in opposite directions from zero. Draw half of the line joining the two zeros. If cross-section paper is used, the fine lines serve directly as subdivisions for the side scales, and the per cent line can be drawn from the center of the sheet to the proper corner. A line drawn from 100 on the right side to 100 on the left will pass through the center of the sheet and fix the 100 per cent point. This means that the first 100 is 100 per cent of the second 100. To get the other graduations, start from 100 on the left side as a base and scale across to 5, 10, 15, 20, etc., on the right side. The intersections of these lines with the inclined line give the various per cent graduations, and the chart is made. All the others are a modification of this simple case.

A few hints may help if the attempt is made to develop a new form. Graduations are sometimes most easily obtained by tracing from a piece of cross-section paper. Thin bond paper is usually best for drawing, as the chart can be blueprinted and the original used only when new copies are required. Two or more scales can be made on the same side lines if the numbers on both sides of the chart are multiplied by the same common factor. Thus two charts can be made by drawing only one, or the range of the single chart is greatly increased. There is liable to be confusion, however, if more than two scales are used. *Figures* 1 and 2 are an illustration of this double construction.

Subdivisions of the per cent scale can be located in the same way as the main divisions; fine ones can be put in accurately free-hand, or there are simple geometrical methods that can be used. There is no necessity of making subdivisions too fine, as the amounts can be very accurately estimated. It must be noted that the actual length of unit per cent decreases rather rapidly as the per cent reading increases, so it is well to accurately determine part of the subdivisions at rather frequent intervals, and only estimate the others over short distances, usually not much more than half an inch. Otherwise, slight errors may creep in and may even be detected in the present charts if applied to the finest work. It is not well to crowd too great a range into a single scale, although if made large enough one chart could cover almost any intervals and give accurate readings.

As in every innovation, the use of such charts may seem a little awkward at first, but they are in reality very simple and will be found to be great savers of time. Although these examples are graduated in the ordinary system of pounds and ounces, the economy would be still greater if they were designed for either the metric or decimal pound systems, as they can be used for systems of weights and for any units from grains to tons.

Cause of Nibs and Lousiness in Dyed Silks

Composition of the Silk Filament—Low Cohesion as a Cause of Lousiness—Nibs Are Produced by Worm; Most Other Defects Arising During Spinning Operations—Nibs Not Increased by Diseases of Worm—Dyeing Operations Do Not Cause, but May Develop, Nibs—Rules to Observe in Degumming

By L. C. LEWIS

Raw Silk Inspector, Wilkes-Barre Silk Company, Paterson, N. J.

THE silken fiber consists of fibroin and sericin; the cocoon filament as it comes from the two glands of the worm is called bavelle brin. These are agglutinated as they come from the worm, and form the silk filament.

The cocoon filaments are channeled and have sericin granules inside and in some cases the fibroin nucleus shows swellings originated by uneven lumps of silken substance. These swellings of the filaments can always be provoked by chemical and mechanical means, thereby giving origin to the defect of dots or nibs which are found in dyed silks.

In 1895 Professor Vlacovich, studying the silken filament, found that alkalies make the channeling evident, even where it is less distinct, as it occurs in the exterior layers of the cocoon.

In 1896 Professor Lenticchia, after a micrographic study of the dots or nibs in dyed silks, concluded that

the channeling is due to extremely thin fibrils of sericin contained in the fibroin. The peeling off of the fiber during the process of dyeing ought consequently to be ascribed to the dissolving of the interior fibrils of sericin. Worms born weak, or weakened by various causes during the breeding, are indicated in the fiber by the first layers of the cocoon, the shape of ribbon, and a greater facility to divide into fibrils.

Causes of Lousiness

Lousiness is also caused by silks with a low cohesion; that is, silk that is poorly agglutinated in the spinning or filatures. This cohesion is affected by the quality of the cocoons and the district from which they come. Cocoons that come from the Sinshiu district nearly always have low cohesion, while cocoons from the Awa district have high cohesion. The following conditions affect the cohesion: Temperature of water, speed of reeling, cross or croisure made during spinning, cleanness of the water, and mineral salts in the water.

Silk that is reeled from fresh spring cocoons has the best cohesion, while the silk that comes from summer and autumn cocoons usually has poorer cohesion. Silk that is stored for a long time in a dry place will have a low cohesion and therefore when boiled off will be hairy or lousy.

Worm Responsible for Nibs Only

Nibs are the only defect made by the worm; all defects such as raw knots, slugs, bad throws, corkscrews, large knots and loops are made during the spinning operations.

We have found that poor raw silk will have a tendency to ravel; therefore, when we know this the dyeing operations must be governed so as to develop as little as possible these defects. The boiling off must be done very carefully and the skeins handled as little as possible. The water should not boil, and the right kind of soap should be used, always remembering that raw silk is a very delicate thread and very expensive.

The use of the soap degumming machine should be encouraged, as with this machine the silk is handled less.

From experiments made on Italian raw silk it is seen that the nibs are no more frequent in filaments near the chrysalis than at the beginning of the cocoon:

(Length of thread examined, 1,900 meters.)

	Number of Exfoliations per 1,000 Meters	
	Sample No. 1	Sample No. 2
Silk of the exterior covering of the cocoon	77	50
Silk of the interior covering of the cocoon	61	58

Nibs Not Increased by Diseases of Worm

The diseases of the silk worm, such as Botrytis Bassiana (muscardine), do not seem to cause more nibs or splitting of the fiber:

(Length of thread examined, 1,900 meters.)

	Number of Exfoliations per 1,000 Meters	
	Sample No. 1	Sample No. 2
Silk of unaffected cocoons	58	81
Silk of affected cocoons	39	58

Thus we find very little difference—no more, in fact, than is found in different sections of the filament.

The effect of fumes was also disappointing:

	Number of Exfoliations per 1,000 Meters
Standard silk length of fiber examined, 6,000	189
Cocoons treated with sulphurous fumes, 7,000	186
Cocoons treated with formaline fumes, 5,000	207

Diseases such as muscardine, humidity and fumes do not seem to cause nibs or exfoliation of the fiber, but they do cause a poor yield of cocoons.

Dyeing Manipulations as a Cause of Nibs

Nibs are not made in the dyeing operations, but are developed by improper dyeing manipulations, as in the following example, wherein 70,000 meters of silk were examined:

	Number of Nibs
Silk dyed in the laboratory	216
Silk dyed by manufacturers	986

The use of old baths should be discouraged, as one must treat longer and the tinctorial substances used in dyeing affect the number of nibs that can be easily observed. For example:

	Number of Nibs per 1,000 Meters
Thread of white silk	378
Thread of yellow silk	481
Thread of green silk	383
Thread of red silk	356
Thread of blue silk	264
Thread of black silk	115

It appears that the visibility of nibs is lessened when the silk is dyed black, and is the greatest in yellow.

Much Depends on Dyer

Even when the manufacturer has a clear idea of all the factors that have an influence on the luster of a fabric, and has regulated the purchase of silk in relation to them, the result is always subordinate to the work of the dyer, who, in his turn, has difficulties to overcome, because the threads are made from different worms, size, degree of twisting, winding and stretching. For these reasons, the work of the dyer often becomes very difficult.

The writer recommends during the degumming the following:

First—That the fiber be motionless in order that it be not exposed to the least strain during the period in which it is immersed in the hot soapy solution.

Second—That inequalities of heating be avoided by having the liquor, in which is the silk, moderately circulate toward a tank in which the heating is done.

Third—That it be possible to take off at certain given moments the silk that requires less ungumming.

Conclusions

That it is the task of the seed producer to take into consideration in his selections the structure of the fiber and to eliminate those breeds in which the silks are usually channeled or subject to exfoliation.

That silk manufacturers ascertain by tests, before the purchase of the material, whether the silk selected is adapted to the making of the goods which they are to produce.

That dyers have the task of treating the silks in such a way that nibs or exfoliation shall not appear.

Notes on Hypochlorous Acid and Chlorine, with Comparisons of Their Bleaching Action

Decomposition of Hypochlorous Acid in Presence of Nitrate—Comparison of the Bleaching Action of Chlorine and Hypochlorous Acid—The Solution of Chlorine in Water—Action of Very Dilute Chlorine Water on Solution of Litmus

By R. L. TAYLOR, F.I.C.

From a paper read before the Manchester Section of the Society of Dyers and Colourists, and printed in the "Journal" of the Society

THE hypochlorous acid used in the following experiments was prepared by distilling bleaching powder, mixed with thirty times its weight of water, with twice its weight of boric acid, as described in a former paper (Taylor and Bostock, *Chem. Soc. Trans.*, 1912, p. 451). The solution of hypochlorous acid so obtained is generally about N/10 × 1.5 in oxidizing power, and contains about 4 grms. of the pure acid per liter.

The solution is quite colorless. When kept, it is fairly stable in the dark, but decomposes more or less rapidly in presence of light, in ways previously described by several observers. In bright sunlight it soon turns yellow and oxygen is slowly evolved. In ordinary diffused daylight two samples lost 63 per cent and 87 per cent of their oxidizing power in five and six months respectively. Another similar sample kept in the dark lost 28 per cent in five months, while still another, kept sealed up in a small flask in the dark, lost only 50 per cent in six years.

During the decomposition of hypochlorous acid, chloric acid and hydrochloric acid are always produced, together with some oxygen and some chlorine. The decomposition probably proceeds in the first instance as follows, corresponding to the well-known change of hypochlorites into chlorates and chlorides—

$$3HOCl = HClO_3 + 2HCl.$$

But as soon as any hydrochloric acid is produced in this reaction it would immediately react with some of the hypochlorous acid and liberate chlorine. This is probably what takes place in direct sunlight, when there is a manifest liberation of chlorine, which is not the case in ordinary daylight with an acid of the strength described.

Decomposition of Hypochlorous Acid in Presence of Silver Nitrate

When a solution of hypochlorous acid is mixed with one of silver nitrate, only a slight milkiness is observed at first, but this soon increases and a curdy white precipitate of silver chloride begins to form, which continues to increase. The decomposition of the hypochlorous acid proceeds quite rapidly under these conditions. The change which takes place is that represented by the equation given above (into chloric and hydrochloric acids), but the immediate removal of the latter by the silver solution greatly stimulates the decomposition. The change is almost complete in a few hours, although a little hypochlorous acid usually remains at the end of twenty-four hours. The greatly increased rapidity of decomposition of hypochlorous acid by the immediate removal of the hydrochloric acid formed suggests that the action is a reversible one—

$$3HOCl \rightarrow\leftarrow HClO_3 + 2HCl.$$

Experiments were made to ascertain if there is any in-

dication of hypochlorous acid being formed by the action of dilute hydrochloric and chloric acids on each other, but the results were all negative. It has been shown, however, by Foerster (*J. Pr. Chem.*, 1901 (ii), p. 141), and Sand (*Zeit. physicall. Chem.*, 1904, p. 465), that the action is a reversible one, so that the accelerating action of silver nitrate is quite explicable.

This rapid decomposition of hypochlorous acid in presence of silver nitrate is interesting in connection with the fact that long ago Dancer (*J. Chem. Soc.*, 15, p. 477) gave a method of preparing *hypobromous* acid by the action of bromine water on a solution of silver nitrate, the action being represented as follows:

$$AgNO_3 + Br_2 + H_2O = AgBr + HOBr + HNO_3$$

Similarly, there is no doubt that hypochlorous acid is produced when chlorine water is added to a solution of silver nitrate, but this hypochlorous acid decomposes so rapidly in presence of the excess of silver nitrate that this action could not be suggested as a means of preparing the acid.

This considerable difference in the behavior of hypochlorous and hypobromous acids in presence of a solution of silver is remarkable. Unders these conditions the latter acid is much the more stable of the two. If bromine water is shaken up with a sufficient quantity of silver nitrate solution and the liquid filtered from the precipitated silver bromide, it remains clear for days and gives all the tests for hypobromous acid. But this does slowly decompose, and, if the solution is kept for a long time, silver bromide gradually separates out, forming shining crystals, which for a time float on the surface of the solution.

This difference between the two acids, hypochlorous and hypobromous, is explained by the fact that while the former is only slightly ionized when in solution, the latter is still less so.

Comparison of the Bleaching Action of Chlorine and Hypochlorous Acid

In former papers the author has frequently expressed the opinion that the general impression that hypochlorous acid is a more active bleaching agent than chlorine is a mistaken one. Further experiments have confirmed this. Many comparative experiments with solutions of chlorine and hypochlorous acid (of the same oxidizing strength), and coloring matters of various kinds, have shown practically no cases where the chlorine did not attack the coloring matter more energetically than the hypochlorous acid. Naturally, the bleaching activity of the latter is greatly stimulated by the addition of hydrochloric acid, since this immediately decomposes hypochlorous acid with liberation of chlorine. (This action is later discussed more fully, and it is shown also that hydrochloric acid also stimulates the bleaching action of chlorine water.)[1] It is remarkable, however, that with moderately strong solutions of hypochlorous acid (say, N/10 to N/20), the bleaching action is stimulated by the addition of other dilute acids, such as sulphuric and nitric, and even phosphoric and acetic acids. But none of them stimulate the action so much as hydrochloric acid, and in the case of very dilute solutions of hypochlorous acid (say N/500), the other acids have little or no effect. Since a solution of hypochlorous acid in water is only very slightly ionized, the stimulating effect of sulphuric and nitric acids is doubtless due to the fact that they introduce many more hydrogen ions into the solution.

If pieces of calico dyed with Indigo or Turkey Red are placed in moderately strong solutions of chlorine and hypochlorous acid of the same oxidizing strength, the bleaching is at once seen to proceed more rapidly in the former; but later the hypochlorous acid becomes more active, and may ultimately catch up with the chlorine. The explanation is that as the hypochlorous acid bleaches by giving up oxygen, it leaves hydrochloric acid, which then decomposes some of the remaining hypochlorous acid, liberating chlorine.

The Soluion of Chlorine in Water

More than fifty years ago Williamson held the view that chlorine water contains both hydrochloric and hypochlorous acids, and that the presence of the former was proved by the fact that the solution gave a curdy white precipitate with silver nitrate. He did not state that the action of chlorine upon water was a reversible one, though he probably had this in mind.

Doubtless this view is correct, although in an ordinary saturated solution of chlorine in water the reaction—

$$H_2O + Cl_2 \rightarrow \leftarrow HOCl + HCl$$

does not proceed far in the direction from left to right; a very large proportion of the chlorine is still in the free state, so that comparatively small amounts of hydrochloric and hypochlorous acids are present in the solution. But if the chlorine water is diluted with four or five times its volume of water,[2] the yellow color practically disappears, and it might be supposed that the action had proceeded to a considerable extent from left to right. The fact that the color partially returns on the addition of concentrated hydrochloric acid seems to confirm this. But in the colorless solution the odor of free chlorine

(*Continued on page 347.*)

[1] An admirable illustration of this difference in activity between chlorine water and hypochlorous acid is to add a few drops of each to separate portions of a dilute solution of Indigo-carmine, which is instantly bleached by the former but only very slowly by the latter. The stimulating effect of hydrochloric acid is very evident if a few drops of it are added to the hypochlorous acid before it is mixed with the coloring matter.

[2] At ordinary temperatures a saturated solution of chlorine in water is a little over N/10, so that the diluted solution would be about N/50 to N/60

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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SIXTH COUNCIL MEETING

The sixth meeting of the Council of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on Saturday, April 22, 1922.

The following members were in attendance: L. A. Olney, William D. Livermore, William H. Cady, George A. Moran, A. E. Hirst, W. M. Scott, Winthrop C. Durfee, William K. Robbins and W. E. Hadley.

The following members were admitted into the Association by vote of the Council:

Active Membership

Bartenbach, Oscar C., 333 Graham Street, Highland Park, N. J.
Colorist, Dyaniline Chemical Company.

Bick, Ernest C. T., 786 Drexel Building, Philadelphia, Pa.
Colorist, Bick Dyeing Company, Inc.

Caffray, William E., 390 Main Street, Nashua, N. H.
Superintendent Dyeing and Finishing, Nashua Manufacturing Company.

Chamberlain, George E., 1650 East William Street, Decatur, Ill.
Plant Manager, A. E. Staley Company.

Doggett, Charles S., Clemson College, South Carolina.
Professor Textile Chemistry.

Faunderlich, Felix, Forstmann & Huffman Company, Passaic, N. J.
Textile Chemist.

Goldman, Dr. Joseph, 667 Vanderbilt Avenue, Brooklyn, N. Y.
L. Sonneborn Sons Company.

Hamlen, Jr., W. G., Room 442, Central Y. M. C. A., Philadelphia, Pa.
Demonstrator, Du Pont Company.

Harley, Alexander, 212 Oliver Street, Fall River, Mass.
Colorist, Algonquin Printing Company.

Newman, Douglas C., 2 Buckingham Apartments, Wilmington, Del.
Colorist and Chemist, Du Pont Company.

Payne, Lorne, P. O. Box 721, Windsor Locks, Conn.
Superintendent Dyeing and Finishing, J. R. Montgomery Company.

Seiler, Raymond A., 3523 Frankford Avenue, Philadelphia, Pa.
Boss Dyer, Philadelphia Silk Works.

Stokham, Burton, 26 Fountain Place, Poughkeepsie, N. Y.
Plant Manager, Palatine Aniline & Chemical Company.

Wilson, C. C., 126 South Front Street, Philadelphia, Pa.
Manager, Du Pont Company.

Junior Membership

Evans, E. J., 2403 West Eighteenth Street, Wilmington, Del.
Chemist, Du Pont Company.

Hartwig, Carl E., Garfield Worsted Mills, Garfield, N. J.
Textile Chemist.

Nuttall, Fred L., 242 Earlham Terrace, Philadelphia, Pa.
Dyer's Assistant, I. A. Harris Company.

It was voted by the Council to have the Secretary send out the list of prospective members immediately.

Respectfully submitted,
W. E. HADLEY, Secretary.

FIFTH RESEARCH COMMITTEE MEETING

The fifth meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held in the Engineers' Club, Boston, Mass., Saturday afternoon, April 22.

The following members were in attendance: L. A. Olney, William D. Livermore, William H. Cady, George A. Moran, A. E. Hirst, W. M. Scott, Winthrop C. Durfee, William K. Robbins, William R. Moorhouse, W. J. Murray and W. E. Hadley.

A very complete outline of "Fastness of Dyed Wool to Fulling, Scouring and Washing" was discussed by the committee, same having been prepared by William D. Livermore, chairman of the special committee appointed for this work. This paper is to be published as a provisional method, and after same has been subjected to criticism and any needed alterations made, will be considered standard for this type of work.

The report of the special sub-committee on "Fastness of Cotton Material to Scouring and Washing," George A. Moran, chairman, indicated that good progress was being made in the work of this committee.

The report of the sub-committee on "Fastness of Silk to Scouring and Washing," W. M. Scott, chairman, showed that this section of the work is coming along very nicely.

Respectfully submitted,

W. E. HADLEY, Secretary.

Provisional Method on Fastness of Dyed Wool to Fulling, Scouring and Washing

The following provisional method on "Fastness of Dyed Wool to Fulling, Scouring and Washing" is published by William D. Livermore, Chairman of the Sub-Committee of the Research Committee which was appointed for this purpose.

In submitting this report the Research Committee wishes it definitely understood that it is provisional and is open for suggestions or discussions on the part of the members of the Association, or any others who may be especially interested.

This method will not be adopted as an official method until sufficient time has elapsed to give everyone an opportunity to make any criticisms or suggestions that may be necessary for its improvement, and with this in mind the Research Committee specially invites such comment.

In making this classification, the colors are regarded as being dyed in full shades—generally 2 per cent of full strength powder colors—by the standard methods for their class, except as particular methods or percentages of color are specified.

Class 1A—Colors fast to four or more hours' ordinary fulling with alkaline soap in the fulling mill without staining cotton, wool or silk, and without changing the character of their color materially or losing depth of color to a greater degree than do the dyes given as standards for this division.

Colors in this division must also stand the test for fastness to hot soap.

Standards:

Vat Indigo (Medium Navy Blue Shade).
S 782—Anthracene Brown on Chrome Bottom.
S 551—Erio Chrome Azurol B (Top Chromed).
S 157—Diamond Black PV 5% (Top Chromed).
S 601—Alizarine Green (Chrome Bottom) Coerulein.
S 774—Alizarine Black (Chrome Bottom).
Fustic 10% Extract (Chrome Bottom).

Class 1B—Colors which are fast to two hours' or more fulling with alkaline soap in a fulling mill without staining cotton, wool or silk, and without losing character of color or depth of shade to a greater degree than the standards for this division.

Colors in this section are not perfectly fast to the hot soap test.

Standards:

S 862—Alizarine Blue Black B (on Chrome Mordant).
S 180—Erio Chrome Blue Black BC (Top Chromed).

Class 2—Colors equal to Class 1B, except that in two hours' fulling they may stain silk or cotton but not wool.

Standards:

S 275—Diamond Black F (Top Chromed).
S 780—Alizarine Red S Powder or Alizarine Red W Powder (Chrome Mordant).
Alizarine Cyanine Blue GG (on Chrome).
Picramic Acid Browns (Top Chromed).

The above classes include practically all true vat or chrome colors when dyed by the methods giving the best results with the individual colors—either developed by oxidation from a vat or dyed on a chrome bottom with or without topping off with chrome or dyed by the top chroming method or by the "chrome-in-the-bath" method.

These colors are not stripped by boiling in a 10 per cent solution of 18-deg. ammonia for five to ten minutes.

A number of colors belonging to the foregoing classes of dyestuffs when dyed by the ordinary chrome mordant method will stain wool materially in two hours' fulling, but are practically all fastened by top chroming.

Examples: Picramic Acid Browns.
Alizarine Yellow R.
Chrome Oranges.

Class 3—Self-colors which stand two hours' fulling without staining white wool materially, but which may stain cotton or silk in varying degrees.

Colors in this class are stripped more or less by boiling with a 10 per cent solution of 18-deg. ammonia for ten minutes.

This class of colors gives normal shades without a mordant, but may or may not be improved in fastness by a chrome bottom or top chroming.

(a) Direct Dyeing Alizarine Colors:
S 865—Alizarine Cyanine Green G Ext.
(b) Triphenyl Methane Colors:
S 545—Patent Blue A.
S 530—Formyl Violet S4B.
and American equivalents.
(c) Sulphon Colors:
S 257—Sulphon Cyanine 5R Ext.
S 188-189—Sulphon Acid Blues.
(d) Diamines:
S 474-475—Diamine Green.
S 343—Diamine Fast Red F.
S 304—Chrysophenine.

A large number of colors are practically used for moderate fulling and belong chemically to this division, but, both in the fulling mill and laboratory test, stain wool more than the standards for this type and can be rated as Class 3B.

The following are examples:

S 856—Alizarine Astrole B.
S 855—Alizarine Sky Blue B.
S 355—Anthracene Red.
S 233—Cloth Red B.

Class 4—Colors which stand a very light fulling and which have a moderate fastness to scouring, but which, unless conditions are favorable, will stain white wool, and probably cotton and silk, too much for practical use.

This class is represented by:

S 161—Fast Red A.
S 543—Patent Blue V.
S 23—Tartrazine, etc.

Class 5—Sour colors which stain wool badly in two hours' fulling and generally bleed continuously with soap, the shade going down continuously.

This class includes many common sour colors, generally used only for dyeing dress goods by the ordinary sour dyeing method.

Examples: Indigotine.
S 524—Acid Magenta.
S 858—Alizarine Saphirole B (dyed sour).

From the point of view of the user of textiles, colors of Classes 1, 2 and 3 should all be acceptable, except that special conditions may arise where exposure to alkaline treatment will render some colors of Class 3 unsatisfactory.

Class 4 should be acceptable where no treatment of goods with soap or alkali is to be expected.

Class 5 should not be acceptable where any fastness whatever to washing with any soap or alkaline detergent is to be considered.

In making this classification the tests have been carried out as follows:

Mill Test

A sample of the dyed wool or yarn is wrapped about a small sample of white wool, a bit of cotton and a bit of silk, and the whole tied into a flattened ball held in shape with silk and cotton yarn tied about it. This ball is sewed up in a strong cotton bag and attached to white goods and fulled in the ordinary course of mill work for two hours.

The ball is then cut open horizontally, rinsed carefully free from soap and dried.

Hot Soap Test

Immerse 2½ grams of the dyed yarn together with pieces of white worsted and cotton cloth 3 inches square in 125 c.c. of soap solution containing 10 grams of neutral white soap per liter. Cover with watch glasses and heat on the steam bath or water bath one hour at 200 deg. Fahr. approximately, stirring occasionally. Rinse and dry. The cotton should not be stained at all. The white wool should be no more than slightly dulled or yellowed. Comparison with a simultaneous test of one of the standards is important until the operator has acquired experience.

Laboratory Fulling Test

Take 2½ grams of the dyed yarn and braid it with smaller amounts of white wool, cotton and silk in such a way that the dyed wool makes good contact with the three undyed fibers. The weight of the dyed wool must be at least equal to the combined weight of the undyed material.

The solution for the test contains 5 grams of white neutral soap and 2 grams of soda ash per liter. Soak the braided sample in 150 c c. of the above solution for sixteen hours at room temperature. Then heat to 140 deg. Fahr. Remove from the bath and mill briskly on a scrubbing board until the wool is thoroughly felted. Rinse, dry and unravel for examination. The test so

made compares fairly well with a two-hour mill fulling.

STANDARDS USED

The standards used in these tests are given in terms as nearly as possible of the original type first described in Schultz, and in nearly all cases the Schultz number is given. It should be understood, however, that American equivalents are made for the majority of the colors selected as standards. As these American equivalents are produced by a number of competing firms, it was thought best not to give brand names that might appear to give a preference for the product of any one American firm.

MEETING OF RHODE ISLAND SECTION

On March 24, 1922, at 8 o'clock, a joint meeting of the American Chemical Society and the American Association of Textile Chemists and Colorists was held at the rooms of the Providence Engineering Society.

A very interesting address was given by William H. Adams, of the Eastern Finishing Company, Kenyon, R. I., an abstract of which is appended hereto, the subject being the chemical processes of water-proofing and mildew-proofing of textile fabrics. There was a large attendance and a discussion followed.

Respectfully submitted,

FREDERIC C. CUSHING, Secretary.

SOME CHEMICAL ASPECTS OF WATER-PROOFING AND MILDEW-PROOFING TEXTILE FABRICS

[*Abstract of an address delivered by William H. Adams, Manager of the Eastern Finishing Works, at a joint meeting of the R. I. Section of the American Association of Textile Chemists and Colorists and R. I. Section of the American Chemical Society, held in Providence on March 24.*]

MR. ADAMS gave a brief historical introduction in which he traced the development of the art of water and mildew proofing from the prehistoric times, when the cave man probably first noticed the effect of wiping his greasy hands on his skin, through the period of the application of the natural bitumens in preserving mummy cloths by the Egyptians, to the complete protection realized effectively and economically in the present day. In this connection, it is interesting to note that the raw materials used in the early attempts at water-proofing are those most used to-day.

True water-proofing is confined largely to cotton fabrics; wool is sometimes water-proofed, silk very rarely, and linen never. For the complete protection of the fabric, water-proofing must accompany and assist in mildew-proofing because the living organisms which are the most active agents in the destruction of the cellulose fiber all require moisture.

The destructive organisms are divided into three classes: algae, mucors, and fungi.

1. Algae.—Algae are essentially pond plants requiring a full supply of water at all times. In time, algae will destroy the cotton fiber completely, although there is actually small danger from this source because conditions favorable to algae growths are seldom encountered by the fiber.

2. Mucors.—The mucors, a larger class, are multicolored slimy growths which require the presence of moisture, not water, and darkness for their work of destruction. When mucors attack cellulose the damage is complete, although the ideal conditions for their growth are not common.

3. Fungi.—This is by far the largest and most destructive class; 90 per cent of the damage done to the commercial fiber is done by fungi. The fungi, or dry rots, consist of varicolored spores at the ends of minute web-like filaments which often grow inside the cotton fiber itself and completely destroy it. The danger from this source is great, because the dry spores are universally distributed, ready for their work of cellulose destruction at any place where the conditions are favorable.

The protection of the cotton fiber from any or all of the destructive agencies enumerated above has grown to be an important and highly specialized industry. The range of substances which may be used in water and mildew proofing is obviously limited to those having no injurious physical or chemical effect on the fiber itself and no dangerous poisonous effect on animal life. There is no single compound the use of which gives absolute protection against all classes of cellulose destroying organisms; each must be handled as a separate problem requiring individual treatment.

Algae are poisoned by certain metallic compounds, the most effective of which is copper in difficultly soluble form. Zinc and lead salts have some toxic effect, iron but slight, and aluminum little or none.

The mucors are not killed by the inorganic compounds which destroy algae; they require treatment with organic resinates. Similarly, the fungi are unaffected by either metallic salts or organic resinates, but require treatment with true disinfectants such as phenol, cresol and pyridine, all of which must be mixed with suitable retaining ingredients which fix them on the fiber and prevent volatilization and sublimation.

The term "water-proofing" is loosely used to cover all degrees of water-repellency from the soft, slightly treated, so-called "shower-proofed" fabrics to the heav-

ily coated and stiff ducks which are permanently and absolutely water-resisting. Ranging between these extremes is a whole series of commercial fabrics varying in physical properties and degree of water-proofing according to the use for which they are intended.

For the more complete types of water-proofing the following materials are used: Natural and artificial asphalts, oils, waxes, greases and tars. Each of these materials has one or more serious drawbacks due to its physical properties. The asphalts crumble, oils dry and crack, waxes granulate and scale off, greases turn rancid and tars become sticky when the temperature is raised. By careful experiments there must be developed from the above-mentioned substances with certain modifying compounds a compromise formula which will give the required degree of water-proofing combined with the peculiar physical characteristics demanded in the fabric.

There is a large field for a moderate degree of water-proofing on soft fabrics, the so-called "shower-proofing." This is usually accomplished by the heating of certain basic, metallic acetates which on decomposition leave basic oxides having the property of increasing the surface tension of the fiber and giving a fairly efficient water-repellent action. Fabrics containing basic acetates of aluminum, zinc, lead, iron and copper all show water-repellent properties when heated, but for reasons of economy and ease of working aluminum is generally used.

Another class of work demands a high degree of water-proofing which will leave the fabric soft and porous; moreover, it must not harden at low temperatures or melt and oxidize at high temperatures. This effect is produced by a blending of the various standard methods.

Complete or "diaphragmatic" water-proofing depends on an impervious coating for the protection of the cellulose fiber. In this class are rubber-coated fabrics and cellulose nitrate and acetate plastics, all of which give complete protection against water but have no mildew-preventing qualities. Cellulose nitrate is plastic, workable under heat, holds filling materials well and is not as dangerous to handle as is commonly supposed. Cellulose acetate is expensive, requires expensive solvents, is not so plastic or ductile as the nitrate, but is non-explosive.

Lately there has been developed an interesting process which gives what may be called a "self-developed" water-proofing. Fabrics are saturated in an ammoniacal copper solution which partly dissolves and gelatinizes the fiber, and when the excess ammonia is driven off the remaining copper-cellulose compound has remarkable water-proofing qualities, although for absolute results the fabric must be after-treated. In addition to the water-repellent properties produced by this treatment it offers the best mildew-proofing obtainable by a single process. The peculiar green color of the resultant fabric and the expense of the process have retarded the general use of material treated in this way, although it is by far the best material yet developed for use in the tropics.

At the conclusion of his talk Mr. Adams explained in detail the characteristic properties and uses of a series of water-proof and mildew-proof finishes produced at the plant of the Eastern Finishing Works, of Kenyon, R. I.

NEW YORK SECTION MEETING

A meeting of the New York Section of the American Association of Textile Chemists and Colorists was held at the Hotel Pennsylvania, Friday evening, April 21.

The meeting was called to order at 8 o'clock by the temporary chairman, E. H. Killheffer. E. G. Quin was appointed temporary secretary, and proceeded to read the minutes of the previous meeting, which were duly accepted as read. A roll call of the Section followed, which disclosed that twenty-five members and several guests were in attendance.

At the conclusion of the roll call the chairman called for a report from the nominations committee which had been appointed at a previous meeting. W. R. Cathcart reported for this committee, dividing his report into two sections.

He said that his committee proposed that the officers of the association be a chairman, vice-chairman and secretary-treasurer, and that these three officers, together with four other members to be elected, constitute an executive committee of seven. Motion was made that this section of the report be adopted, and it was unanimously carried.

Mr. Cathcart then reported that the committee's nominations for officers were as follows: Chairman, Percival J. Wood; vice-chairman, W. R. Cathcart; secretary-treasurer, E. G. Quin.

There being no other nominations presented from the floor, the secretary was instructed to cast a unanimous ballot for the officers named.

Mr. Cathcart then proceeded to report for the committee that in their opinion the additional four members of the executive committee should best be balloted for. He said that the committee wished to place in nomination ten members, of which four should be elected. The ten members placed in nomination were: Frank J. Oesterle, Walter M. Scott, John H. Culver, Oscar R. Flynn, Frank C. Holden, Daniel P. Knowland, K. M. McKenzie, E. F. L. Lotte, E. H. Killheffer and Joseph F. X. Harold.

Tellers were thereupon appointed and the meeting

proceed to ballot for selection from the above-named nominees, each member voting for four candidates with the understanding that the four receiving the highest number of votes should be elected. After the ballots had been counted the secretary reported that Messrs. Flynn, Killheffer, Oesterle and Scott had been elected. At the conclusion of the balloting the newly elected chairman, Mr. Wood, took charge of the meeting.

Addressing the chair, Mr. Killheffer introduced the question of the location and frequency of future meetings. He reviewed the question discussed at the previous meeting of the desire on the part of many members of the section that at least some of the meetings be held in Passaic or Paterson. He also expressed the opinion that a better spirit of fellowship could be developed if meetings were preceded by an informal dinner. A general discussion of this topic took place, at the close of which it was moved and carried that there be nine meetings during the year, to be held approximately one each month with the exception of the summer season, and that these meetings be held on the fourth Friday evening of each month. The question of location of the next meeting was left to the executive committee.

The question of financing the local Section was next discussed, and it was agreed that the executive committee should report a recommendation covering this matter at the next meeting.

The chairman then introduced Dr. E. W. Norris, of Manchester, England, a visiting member of the British Society of Dyers & Colourists, with the remark that he hoped Dr. Norris would advise the newly formed Section of measures which had been found helpful in promoting interest by the British society and that he would not hesitate to criticise anything which he might have thought faulty in the organization of the New York Section.

Dr. Norris said that he felt the American Association as a whole, and the New York Section in particular, had a wonderful future before it, and that he was convinced that an organization of this sort could be of inestimable service to the American textile industry and those who served it. He suggested that a larger executive committee than the seven elected might be desirable; also that the Section make an effort to interest the schools and colleges, both students and instructors, and not confine itself too closely to the commercial side of the industry. He also favored the admittance of members not strictly engaged in textile chemical lines but whose affiliations or bents led them to take an interest in these matters. He said that many of the hardest working members of the British society were men who were not strictly chemists, in any sense of the word. He commented on the fact, brought out in a previous discussion, that the Chemists' Club, of New York, had found it necessary to charge $35 for the use of Rumford Hall for an evening, and said that in England a nominal fee of $3 was charged by several of the Bradford societies owning their own buildings for the use of auditoriums or meeting halls.

He emphasized particularly the desirability of interesting students, saying that it was often possible for the older members to learn much from the younger generation, and that the future of this generation could be materially brightened by helpful association with the more experienced members. He also expressed the belief that concentration on the technical features of the Association and the exclusion of the social side was a grave mistake; that the meetings should be made entertaining and pleasant as a first consideration, and that technical matters should be of secondary importance. He did not mean by this to minimize in any way the importance of technical work, but felt that larger attendance and general interest could be secured by accentuating the social side of the Association. He said that the experiences of the English society was that special efforts should be made to make the initial meeting of the fall season a particularly interesting one. He said he felt efforts should be made to secure one or two speakers of national prominence whose presence would be sure to draw a large attendance; that by this means interest would be stimulated at the start of the season which could then be more easily maintained through subsequent meetings. He suggested that papers read cover as wide a variety of subjects as possible; that in his experience nearly every member was able to talk on some subject which, although it might not be of primary importance to the entire membership, would at least be interesting and serve to increase the general fund of knowldge. In closing, he emphasized the necessity of keeping business out of the Association and the strict avoidance of the formation of internal cliques or anything that smacked of politics.

The chairman thanked Dr. Norris for his remarks and addressed the meeting at some length, saying that he appreciated the honor that had been shown him, that he felt great confidence in the executive committee which had been elected and was sure that if all members cooperated a very successful Section could be maintained in the New York district. He emphasized the necessity of every member taking an active part in the affairs of the Association, and urged each one to give thought to the possibility of presenting papers on subjects which would be of general interest. He said that many subjects which were not strictly chemical but were nevertheless in a general way allied to chemistry could be discussed with great benefit to all members.

A general discussion of various subjects previously introduced followed the chairman's remarks, during the course of which a test vote was taken as to the location of the next meeting. The vote showed a considerable majority in favor of Passaic. The meeting then adjourned subject to the call of the executive committee.

MEETING OF NORTHERN NEW ENGLAND SECTION

April 22, 1922, at Engineers' Club, Boston, Mass.

A profitable and interesting meeting of the Northern New England Section was held at the Engineers' Club, Boston, Mass., on Saturday evening, April 22. About sixty-two active members, with their invited guests, were present.

A very social half-hour was enjoyed by many before the dinner, at which old acquaintances met. The younger members had a rare opportunity to meet personally and to converse with the more experienced chemists and dyers—an opportunity which was well accepted on both sides. The social side of these meetings will undoubtedly be a big asset to the Section and to the Society.

After the dinner hour Mr. Christison, Chairman of the Section, spoke briefly on the purpose of the meeting and introduced as the first speaker Louis F. Bume, dyer at the Ayer Mills, Lawrence, Mass. Mr. Bume presented the following interesting paper: "The Causes for Shady and for Cloudy Goods."

The Causes for Shady and for Cloudy Goods

By Louis F. Bume

The causes of shady or cloudy goods are very numerous. First consider the mechanical part. The speed of the drums carrying the cloth through the dye bath will vary with the different kinds of goods. At an average, 80 yards of cloth should go around once in one minute. Cloth which felts easily should go slower. The steam piping should be so that the heat is the same all over and so that no direct steam can possibly strike the goods. The feeding of the chemicals or dyestuffs must be done slowly and evenly. The chemicals or dyes should be very much diluted and thoroughly dissolved and strained through a very fine strainer into the dye bath. If the quantity of dyestuff used is only a small one, this small quantity should be added with as much water as though the quantity were large, so as to distribute it slowly through the dye bath.

The raising of the temperature should be gradual and the time used to bring the water to a boil must naturally vary according to the cloth and the dyes used. A heavy, closely woven cloth must be heated more slowly than a thin, light-weight cloth. Sour dyes require less time than chrome colors. In raising the temperature one must consider the pressure of the steam and the temperature of the water when starting. If it is found best to have the dye bath at 125 deg. Fahr. in half an hour, less steam should be used in summer than in winter. The steam pressure should be the same all the time, to enable the kettleman to know how much to use. There are instruments on the market which will regulate the heat automatically and as desired.

The water plays an important part. Hard water should be softened, unclean water filtered. The water coming from swampy sources will at different times of the year cause trouble when vegetable matters cause fermentation. I know of mills in certain localities that will close their dyehouse at such times for a few weeks, as experience has taught them that they will have cloudy goods.

The mordants and acids and the quantity of these used have a great deal to do with producing even results. Some dyes require more, some less, acid to get the best results. There are dyes on the market which will precipitate in the dye bath in the presence of a small excess of a weak acid, like acetic acid, and cause cloudy goods which will crock in some places more than in others.

I will tell of some experiences. In a mill where they were having cloudy goods I found that the dyestuffs and the treatment were all right. They speck-dyed the goods with sumac and nitrate of iron. The sumac bath was retained and strengthened after every dyeing. I noticed a sour odor to the sumac bath. I started a new sumac bath and the trouble ended.

Another time the goods were very cloudy. I noticed a slight yellow stain on the goods. Upon investigation I found the cause to come from the filter beds and water tank. The filter beds were located near the coal bins. There had been a fire in the coal, which was put out by water. This water found its way to the filters and the tank from which the water was drawn for dyeing. Using the unfiltered water until everything was cleaned ended the trouble.

In another instance I found that the yarn department had substituted the olive oil they used by a lard oil which had become rancid in the course of time. Washing the cloth in the usual way did not remove the oil, so I had to boil the cloth with a solution of alkali, and then scour before dyeing.

A good deal of trouble is caused by the goods lying wet before and after dyeing, especially in a warm room. The parts of the cloth exposed to the air will dry partly or entirely and absorb the dyestuffs differently. If they partly dry after dyeing before scouring, the dry parts will not lose as much color as the wet parts, causing uneven goods. I have seen trouble caused by scoured goods being stored before dyeing for a few months near the windows, where the light would strike the exposed parts. These exposed parts dyed lighter shades than the rest of the cloth.

Carbonizing is very often the cause of a good deal of trouble. When carbonizing with sulphuric acid all sunlight should be excluded during the process. Uneven extracting of the goods then drying will give trouble.

When using chloride of alumina the precipitated alumina will deposit on different parts of the goods, and when not removed thoroughly will explain clouds. The neutralizing must be done with a great deal of care to remove the acid or the chloride of alumina thoroughly. It is best to carbonize after dyeing either with sulphuric for sour dyes or with chloride of alumina for chrome dyes, then neutralizing properly.

The cloth must be very clean before carbonizing. I know a mill which was carbonizing the goods of the loom, then washing. The result was badly clouded goods. Too much washing before dyeing is also injurious. Sometimes the dyer will complain that the goods he receives are not clean. To obviate this, the finisher will give the goods one or two extra scourings. This is as bad as dirty goods.

Shadiness—that is, the cloth being darker or lighter the whole length of the piece—cannot be done in the dyehouse, but may be helped. A tight selvedge will usually cause the color to be lighter near the selvedge, while a loose selvedge will cause the shade to be darker. Sometimes this can be helped by sewing the lists together, making a bag with openings every ten or twelve inches to let the air escape. This will also prevent wrinkles at the same time.

The sizing of the warps, the fermentation of the size when left to stand overnight or holidays, will be hard to remove at times and will cause trouble.

The introduction of the second speaker, Thomas J. Biery, dyer at the Pacific Mills, Lawrence, Mass., by the Chairman came as one of the pleasant surprise features of the evening's program. Mr. Biery's name had not been mentioned previously because the unintentional delay in inviting him to speak brought back his acceptance too late for the Secretary's notice. Mr. Biery's paper, which follows, received enthusiastic applause. Mr. Biery spoke on "Shaded Goods."

Shaded Goods

By Thomas J. Biery

Shaded goods are the bane of the dyer. This is something that must be guarded against. Cloth to be of marketable value must be uniform in color and design as well as in finish. It stands to reason that a piece improperly shaded loses much of its value. Therefore it is of the greatest moment to produce a fabric that will stand the severest test from every angle.

Many defects are caused in the finished fabric by scouring and steaming. Among these defects the most common are what are known to the trade as "shaded pieces." Oftentimes the result in shades is very annoying. Now the question is how do these shades come and how can they be avoided?

When a piece is unevenly shaded, that is, when it does not shade truly from center to side, and from end to end, the cause may be found in the steaming, or it may be caused by improper scouring, as when the pieces are scoured too hot, or when there is too much alkali in the soap used, and this is not properly washed out.

If the uneven shade comes from the steaming, this is because the piece receives a more severe steaming in one part than in another. The portion receiving more steaming than another will be darker in shade. Uneven steaming may be caused by imperfect perforations in the steam shell. The steam should come through the shell through countersunk perforated holes, about one inch apart in both length and width of pipe, and should enter evenly from both ends of shell to center, and should steam from ten to fifteen minutes, at about ten pounds pressure. Another thing to look to is the covering of the shell, for this as well as the leader, of which I will speak presently, is of prime importance.

The shell should have a thick covering so that when the steam comes into contact with the cloth there will be an even distribution or cloud of steam. This covering also prevents too much pressure. A very necessary thing is the leader. This is a wrapping wound around the outside of the cloth so that the cooling process will be uniform, that is, not too rapid nor more rapid in one part than in another. This gradual cooling, made evenly all over the piece, will produce splendid results. An evenness of shade, then, calls for an evenness of steam going through the cloth, for evenness of temperature in cooling, and for evenness of perforations in the steam shell. All this means that the results looked for will be obtained.

Now this steaming may be done in vertical or horizontal shells. In the vertical, it seems to me, that there is more chance for the cloth to show shadiness than in the horizontal. The reason for this is that there is likely to be more condensation in parts, consequent upon the unequal distribution of the steam, and the result will be irregular shading. In the grade of worsted dress goods that we are doing we prefer the horizontal shell.

All uneven shades, however, do not come only from steaming and scouring. They may come from dyeing. Among the causes for this I may mention a fluctuating steam pressure, for if the pressure is not even, the shading will not be even. Bringing pieces to a boil too quickly, or exhausting the dye bath too rapidly, especially when using a color like the Sulphon Acid Blue type will cause uneven shades. Also shading up

with concentrated dyestuff, or feeding red on light shades and cooling dye baths too quickly. Another cause is the rolling of pieces in kettles, this comes from tight selvedges, and may be overcome in the manufacturing, or by tacking the selvedges before they enter the dye baths.

These few remarks will answer, I hope, some of the difficulties in regard to "shaded pieces." We may not always reach perfection, but at least we strive for it. All our efforts are directed at giving satisfaction, not alone to our employers, but also to the general public, whom it is our aim and will to please.

Walter F. Haskell, dyer at Dana Warp Dyeing Company, Westbrook, Me., spoke in an interesting way about "Some Experiences with Uneven Cotton Warp Dyeing." His paper follows:

Some Experiences with Uneven Warp Dyeing

By Walter F. Haskell

I cannot say very much directly about shady goods for I have been engaged for a number of years in dyeing cotton warps to be sold and woven outside of our own mill, and it is not very often that I see the finished goods of which our warps form a part. I have, however, frequently met with certain defects and faults in warp dyeing which one would expect surely to cause shadiness or streakiness in the finished cloth.

There are a great many causes of bad work of this sort. They may be divided roughly into failures of machinery and errors in the use of the necessary chemicals and dyestuffs. There is also the human element which dyers have to consider.

Not long ago at our mill the section beams made from a certain two-ply yarn began to show a few ends here and there, much darker than the proper shade. These dark streaks appeared on one or two ends only at the same time, and were only a few yards long but there were enough of them and they were sufficiently distinct to make the whole set of beams unfit to be used, and the whole 2,000 pounds of yarn had to go into black. This was a problem, for both colors had been inspected before they were twisted together and passed as entirely satisfactory. Investigation, however, revealed that while one of these colors was being dyed the driving belt had come off and the machine had stopped with, of course, a short length of the double warp immersed in the somewhat concentrated liquor. The operator of the machine had put the belt on as quickly as he could and gone ahead without saying anything about his trouble. The dark places caused by this stop were so short that they were pretty well covered up as the warps were folded off the dry cans and were not detected by the ordinary brief examination given the warp at the dryers. Even these dark places would not have caused much trouble, being less than 1 per cent of the whole amount of the yarn, if they could have been kept together, but this yarn had to be twisted with the other color, spooled and warped again on section beams, which mixed everything up very thoroughly.

This was the simple explanation of a rather serious failure and I give it as an illustration of mechanical trouble with the human element also involved.

A frequent error in dyeing light tints with sulphur colors has come with the use of insufficient amounts of sodium, sulphide and soda ash. I have in mind a certain tan tint which has been dyed at our mill for several years. It requires a mixture of three sulphur colors, one of which is black. When we first began to dye this tint we had uneven results rather too frequently. Often parts of the warp would have a gray look quite different from the yellowish tan which was the true tone. In my endeavors to correct this trouble I went over my formula and dyeing process very carefully. Everything looked to be satisfactory; there seemed to be plenty of sulphide and soda ash in the formula but I thought that perhaps the gallon or two of stock liquor which was put into the 400-gallon tank of the dyeing machine to start the dyeing did not carry enough sulphide with it to keep the color in solution and the dyes, especially the black, were thereby given a strong tendency to become precipitated on the yarn, and that this might be the cause of the grayish streaks. On the strength of this reasoning I decided to put a few pounds of sulphide and the same amount of soda ash into the bath before adding any dyestuff, and I was much gratified to see an immediate and decided improvement in the evenness of this color.

This, I think, is a good illustration of a chemical error.

I have been speaking thus far of chain dyeing. I will now refer briefly to beam dyeing.

I have heard it said that there would never be any streaks in beam-dyed warps, but unfortunately this statement is not true. We have dyed for several years a certain gray of medium depth using a sulphur blue, a dark brown and a little bordeaux. Good results have been very uniformly obtained in chain dyeing this color and we expected equally good work in beam dyeing. When we tried it, however, we found that the combination of dyestuffs used could not be brought to a very clear solution. It was difficult to filter the bath properly and the flow of the bath through the beams seemed to be somewhat impeded. However, the color came up to shade satisfactorily, the outside and the inside samples checked up well and the beams appeared to be in first class condition. When they were put into the slasher the first two or three beams dressed were very good, but after about one-third of

the set had been run streakiness and cloudiness began to appear which grew steadily worse as more was run off the beams. Apparently the dye of poor solubility had caused incipient channeling starting from the barrels of the beams, for by substituting a more soluble brown I have been able to produce the same shade with scarcely a trace of streakiness.

I have related a few of my own every day experiences. These may seem rather commonplace in the telling but they were rather too seriously interesting to me when they happened, as you gentlemen can readily understand, especially you who are in the mills.

Summary

Uneven dyeing of cotton warps may be caused by some mechanical failure or error of judgment in the use of dyestuffs and chemicals, or by simple carelessness.

Dark places caused by interruption of the progress of the warp through the dye bath are apt to become scattered through a large lot of yarn in the processes subsequent to dyeing and cause considerable trouble.

It is important to have sufficient sulphide of sodium and soda ash in the dye bath at the beginning of the dyeing operation in dyeing with sulphur colors, especially with light tints. This is necessary in order to hold the first small additions of dye in solution, and to prevent any tendency for it to be precipitated on the yarn.

Dyes of poor solubility are very apt to cause streaky dyeing in beam dyeing machines.

Following Mr. Haskell, a paper prepared by Frank E. Johnson, dyer at Wood Mills, Lawrence, Mass., was read by P. F. Ripley, chemist at the Wood Mills. Mr. Johnson was unfortunately detained at home because of sickness in his family, and sent his regrets for his enforced absence to the Section, through Mr. Ripley. Mr. Ripley read the paper in a very effective manner. Appreciation of the courtesy of the reader and of the contents of the paper was expressed in loud applause. Mr. Johnson wrote on "Some Causes of Shadedness and of Cloudedness." His paper follows:

Some Causes of Shadedness and Cloudedness

By Frank E. Johnson

I have been asked to read a paper relative to my experience with cloudy and shady goods. The causes for cloudy and shady goods are many. To be reasonably free from either requires the constant attention on the part of both the finisher and the dyer in following up each operation. There are *causes* for these troubles, and it is the duty of the dyer and the finisher to work together to find the source of the trouble and make the corrections. Most of the trouble is caused by the goods not receiving the proper treatment in the finishing and dyeing departments. If a piece is not finished evenly before dyeing it will not dye evenly, but will take up the dye according to the condition of the piece. For example, a piece shaded end to end but even in color from side to center; a piece shaded from side to center consistently from one end of the piece to the other. Also, carbonizing with sulphuric acid before dyeing is a very troublesome process, causing all shapes of stains which resist the dye. These are faults caused before dyeing. A dyer has no control over these conditions.

Cloudy and shady goods are caused by these reasons:

1. Poorly prepared; not thoroughly clean from the wet finishing.
2. Steamed goods: Uneven steam pressure; steam not allowed to pass through goods evenly, due to carelessness.
3. On the crabbing machines, uneven roller pressure.
4. Varying temperature of water.
5. Goods rolled up wet to set filled with dirty water.
6. In the dye kettle, goods taking up dye too fast caused by admission of steam too rapidly. Another is in using too much acid. These are two important factors to watch and are governed by the dyes being used and the material being colored.

Faults from Speck Dyeing

Most of you know the object of speck dyeing. In worsted or woolen mills there is more or less vegetable matter in the stock. After the goods have been dyed it is necessary to either speck dye or to carbonize to eliminate these specks. Some mills use sumac extract and nitrate of iron, and experience more or less trouble on account of the sumac. It is very important that the sumac should be a thoroughly filtered solution and should be applied evenly on the goods. Any sediment or uneven application of sumac before coming into the nitrate of iron bath means cloudy goods.

Driers

It might seem strange to say shady goods can be made in a drier, but I do not hesitate to make the statement.

Many pieces of goods have been called "shady" when the real cause was uneven shearing from the shears and uneven pressure on the press in the dry finishing.

Cloudy and shady goods are not altogether a dyehouse problem, but are usually charged to the dyehouse.

To keep the situation well in hand requires daily attention and the closest co-operation in all departments.

Leverett N. Putnam, dyer at the Arlington Mills, Lawrence, Mass., followed Mr. Ripley and gave a very interesting account of some of his "Experiences with Shady Piece Goods."

Mr. Putnam also entered heartily into the discussions following the last speaker.

Experiences with Shady Piece Goods

By Leverett N. Putnam

Shady goods among piece dyes is a troublesome condition which all dyers and finishers would like to forget and never recall that such a condition ever existed or could exist. Nevertheless it is a condition which does exist at times and has to be dealt with according to the source of the trouble.

The source of this trouble is rather hard to locate. All things must be taken into consideration. Conditions up to and through the dye house, even through the sponging house, must be borne in mind. In this paper I am going to consider those conditions applying only to the dried piece of cloth after dyeing, as that will include the most important places where this trouble could be caused.

Let us take as our typical example that of dyeing worsted pieces. All conditions which would interfere with any other branch of dyeing would also interfere here.

The processes to which this line would be subjected to more or less would be the following:

1. Crabbing (Butterworth).
2. Steaming.
3. Fulling
4. Washing.
5. Dyeing.
6. Drying.

Now let us consider each process and the results which could occur in the form of shadedness later if this particular process were not carried on in a manner to obtain proper results.

1—Butterworth Crabbing

Crabbing, or setting a piece of cloth to prevent it from shrinking unevenly or from becoming cockly, is resorted to on the lighter fabrics, such as dress goods, linings, and the like, particularly on the coarser lines of dress goods and men's wear. In consequence of this operation, if not properly done, there will result pieces which will be shaded from side to center or end to end. As a general rule the shadedness from side to center will be dark sides and light centers. The cause I can only guess at, but I attribute it to tension and unevenness in heat and water absorption as it runs out of the hot liquor for winding onto the roll.

2—Steaming

As a rule the opposite effect is produced with improper steaming. The tendency here is for centrally dark pieces. The cause here is also one of tension and heat distribution. I might say that a piece improperly crabbed will be remedied or at least receive the effects of steaming (whether good or bad) because the steaming is so much more violent and at a higher temperature.

3—Fulling, and 4—Washing

Except that a piece of cloth is made to roll at the selvedges I cannot see where there should be much trouble from these sources, as regards shadiness. Trouble here, barring a piece whose selvedges roll, would be confined more to a cloudy, muddy or blotchy condition.

5—Dyeing

The next step to be considered is the dyeing. It is the general opinion that a strictly shaded piece cannot be made here unless there is a condition further back in the process which is responsible. Perhaps this assumption is correct. I want, however, to bring out a possibility which I think is a reasonable probability.

A great many times shadedness will be found on pieces which have had no preliminary treatment except scouring. The shadedness must be caused somewhere. The only possibilities up to this point will be the spinning oils used, the tension and size preparations in the dressing, the weaving and scouring. There are possibilities for shadedness in all of these places but where proper oils and sizes are used the possibilties are not great. Tension in a dressing and weaving are greater probable causes. All these possibilities are eliminated where pieces of any particular style are dyed and certain sets come out all right while others do not. In such a case the only places left are in the dyehouse and drying. A distinction can be made here by extracting and air drying to thorough dryness the pieces in question, in which manner the drier conditions will be eliminated.

It is my opinion that shadedness, so-called, can be caused in a dye kettle where no preliminary treatment has been wrong. Let us consider the pieces as they run into a kettle. They are in the rope form and as a rule it will be found that the selvedges are on the outside of the rope a large proportion of the time. I can give no explanation of this fact, but from observation I am certain that it is so. Let us assume that this is the fact. Why could not a piece be shaded due alone to penetration if certain parts are exposed more than others to the dye liquor? A difference in shade is often apparent at the sewings when one compares the outside to the inside of the seam, due to improper penetration. Again in the case of a tacked or bagged piece, if the dyeing has not been carried on slowly

enough a difference in shade from back to face will be apparent.

You probably are thinking, why should not the piece then be cloudy rather than shaded? If the exhaustion has been much too rapid it will be. Allowing a reasonable time for the color absorption there will be sufficient time for the folds to change about so that this cloudiness is not noticeable but still the selvedges, as I said, I am assuming, are always to a greater extent on the outside of the rope, and consequently exposed more to the action of the dye liquor. The consequences are that, if my assumptions are correct, the selvedges will be darker than the center.

To try to bring out this fact I have in mind trying to dye a certain type of goods, prepared by scouring only, by two different combinations of dyestuff. By one method I found that I could obtain very good results, but the other method gave me shaded pieces. I could not blame shadedness in this case to preparation. On air drying directly from the kettle I obtained the same results. By working on the combination which was giving me trouble I at last obtained a method of application, using the same dyestuffs, which allowed me to dye this same style with success.

I want to say a word about this particular shadedness. Although it was not apparent at times, certain pieces besides being characteristically light center would also show cloudiness to a more or less extent. At other times the striking fault would be shadedness. Always there would be that characteristic light center. I imagine, if the eye were sharp enough cloudiness could have been found in every case. However, shadedness was very apparent. By working on the fault from a point of penetration, using the inside of the sewings at the seam as a guide, I obtained less shadedness according to the success in this respect.

6—Driers

The next and last step which I will consider is the drying. A piece of cloth may be shaded here very easily, depending on the dyestuffs which are on the piece and the amount of heat applied. Some dyestuffs are particularly sensitive to heat — Gallocyanine being one such color which after being changed by heat does not return to its original shade. Great care must be taken to have proper circulation and not too much heat. Drier trouble can always be traced by air drying the pieces directly after extracting. Care must be taken here to see that they are perfectly and evenly dried. It is best to leave them a sufficiently long time to be sure that they are dried all they will because a piece always dries from the selvedges to center and a little variation of moisture will show a lighter and bloomier center.

Frederick Spencer, dyer at the Arlington Mills, Lawrence, Mass., was the last speaker. His remarks were related to top dyeing and he gave some valuable suggestions drawn from his experiences.

Causes of Unevenness in Top Dyeing

By Frederick Spencer

It is my opinion that a lot of unevenness in dyeing could be overcome in the laboratory, when the chemist is making up the formula, if he would select out the dyestuffs that would work the same way in combination and, if he could not find dyestuffs of this description that would please the trade, to inform the dyer how the different dyestuffs acted with acid, and then the dyer could work goods to get even dyeings.

Of course, in slub dyeing a little unevenness in dyeing sometimes doesn't hurt anything, as it will gill up even, but it is most sure to throw the shade off so it will not match the standard.

It was only a short time ago that I ran into some trouble with uneven dyeing and couldn't seem to find out what was causing it. I would start four kettles with the same statement and work them the same way, yet there would be one or two sets come out uneven and sometimes the whole four would be uneven. These sets were dyed in the Marteens system of dyeing, which is similar to all top dyeing machines, except that the stock is wound on spools and these spools set in sockets inside the kettle. Now, that is just where my trouble was. With putting the spools in the sockets so many times they had spread, which caused a leak; so that some of the liquor, instead of going through the stock, would go out at the bottom of the spool and out at the top of the kettle.

Now, to overcome this I had some rubber washers made to fit the sockets and had the spools milled out at the bottom so that there was a small taper that drew down on a plug and made a tight joint on the rubber washer. This overcame all my troubles with uneven dyeing, as I haven't had an uneven set since, and at the same time made it so that I could increase my production one-fifth by putting stock on a spool.

I have found by experience that it is absolutely essential to stop all leaks, to keep the system free from air so that there would be no air spots on the dyed goods; also to see that there are no channels in the stock where the liquor would go through and cause poor circulation through the rest of the stock, which would cause poor dyeings. You should make sure that you have good circulation at all times.

When all six of the speakers were finished the meeting

was thrown open for general questioning and discussion.

John Bannan started the discussion with an experience in connection with a Franklin process yarn-dyeing machine due to improper circulation.

Winthrop C. Durfee mentioned a case where he was called in to straighten out a difficulty related to uneven dyeing. Everything in this case appeared to be correct except the fact that the goods had been brought to a boil in ten minutes and rushed through. Mr. Durfee suggested as a remedy a much longer time in the dyeing process.

He mentioned the fact that in dyeing wool there are two sets of chemicals being dealt with, both of which become much more active chemically at elevated temperature. One set is the wool fiber and the second consists of the dyestuffs and acids in the dye bath. He said that in his belief good solubility of the dye and plenty of time in dyeing are wise conditions to provide where possible in eliminating shaded goods.

Mr. Robbins spoke of experiences with certain sulphur colors which were dyed and the goods exposed in the wet condition before washing. The exposed parts on the outside of the pile oxidized more than the unexposed parts on the inside, and when the pieces were washed the unoxidized dye was partly removed, giving uneven dyeing.

Mr. Robbins also mentioned cases in which eleven out of twelve leads in same dye liquor would be perfect and one-half of twelve would be shady. He found this hard to explain. As another thing somewhat "hard to explain," he recalled instances of goods which had been set back from the perch on account of shadedness and which after no further treatment than standing upon the trucks in the dyehouse were returned and passed as satisfactory.

Mr. Putnam suggested a possibility for the explanation of Mr. Robbins' trouble with one-half a piece out of twelve showing cloudedness. He had had cases where unevenness compared piece to piece in same dye liquor had been traced back to uneven steam heating. In remedying this condition he had changed steam piping, reel position or false partitions. If the steam tends to go to the sides of the kettles, then the center pieces will be injured in shade. He believes some forms of unevenness often blamed to scouring are really due to uneven heating.

Mr. Moffatt asked if anyone using automatic devices for controlling steam entry to dye kettle had had incorrect control through the bulbs of the thermometers becoming covered with lint.

Mr. Putnam in reply said that he had used the Tagliabue automatic controller and had found that after it had been carefully adjusted it was highly satisfactory.

Mr. Moffatt then asked concerning the closeness of control of the temperature.

Mr. Putnam stated that the indicators had a nominal range (not the minimum) from 100 to 212 deg. Fahr. and were accurate within 1 deg. Fahr., regardless of the steam pressure (which might vary from 7 to 11 pounds).

Mr. Moffatt asked if trouble were caused by fibers on the bulbs.

Mr. Putnam said he had tried the device in the front and in the back of the kettles. He got best results in the front and there was no fiber contamination 1½ feet from bottom even after three to four months. The device gave good satisfaction.

Prof. Olney asked Mr. Putnam if he could use the controller to bring the kettles to a boil in a given time.

Mr. Putnam stated that he could, for the time-temperature control was incorporated into the device. In raising the temperature the steam entry is intermittent for each 2 to 4 deg. of rise, but at the boil it is practically continuous The control may be set to bring to a boil with any rapidity, from forty-five minutes to two hours, and when once set is capable of being used continuously from day to day. He finds that it is serviceable in speck dyeing, where the device by clock control is used to bring the bath to a desired temperature in a given time and then holds this temperature during the run. In dyeing a Diazine Black he uses a temperature of about 130 to 135 deg. Fahr. By setting the stopclock for this temperature the steam is automatically shut off when the temperature is reached. After the time has passed the goods are washed. A continuous record shows any variation during the process and helps to reduce the human element.

Mr. Claflin mentioned the conditions prevailing in some dyehouses where steam is taken directly from high-pressure lines by means of a reducing valve. In his opinion the chemicals used often cause shadedness through unequal absorption of acid. Sulphuric acid, though used in small amounts, is more liable to localize than many dyes. At times where hard water has been used and the goods improperly scoured, shadedness may be due to magnesium soaps, which are not easily removed. In such cases of imperfect scouring magnesium has been detected upon the fabric by chemical analysis.

The Chairman asked if he had heard of trouble coming from the use of epsom salts in the dye bath as used to be done.

Mr. Claflin replied that in the absence of fatty acid upon the material no harm would result.

R. E. Fuller stated an experience of his in dyeing five-yard pieces with sulphuric acid, Glauber's salt and dye. Unless he took the precaution to add the Glauber's salt, then the acid and then to saturate the goods cold before adding dye, he usually obtained uneven results. He wondered if the Glauber's salt and sulphuric acid had any bearing on uneven results.

Winthrop C. Durfee answered from his experience that if the wool is filled with acid, then the affinity for the dyestuff (a second acid) is lessened and even results with the latter are more liable to be obtained. He finds

wool to have a greedy affinity for 3½ per cent sulphuric acid. In trials with chrome alum alone uneven results were obtained. Chrome alum with varying amounts of sulphuric acid up to 21 per cent gave even results. This illustrates again the strong affinity for acid. The chromium in chrome alum is basic; that in dichromate is acid and, like an acid, is absorbed readily; hence the difference in the efficiency of the two salts as chromium mordanting agents. Chrome alum plus 3 per cent tartar gave a good result. Mr. Durfee believes the chromium is reduced inside the wool. The basic chromium itself consumes some of the acid.

Mr. Davies spoke of the inadvisability of the uncommon practice of using 21 per cent sulphuric acid in actual dyeing.

Mr. Fuller thought the sulphuric acid satisfied the acid hunger of the wool and decreased its affinity for dye. One per cent sulphuric acid did not satisfy as well as three per cent sulphuric acid.

Mr. Claflin, in reply to Mr. Davies, questioning the practicality of 21 per cent sulphuric acid, said that the commercial practice represented an optimum and not a maximum. If less per cent than the optimum is employed more can be absorbed, and hence the affinity for dye is greater. An excess of acid lessens the affinity.

Mr. Bume stated that some dyers add the Glauber's salt first, followed slowly by sodium acid sulphate. This gives good results.

Mr. Fuller said he tried this and discarded it for his particular case. He believed the addition of Glauber's first followed by sulphuric acid formed the acid sulphate which modified the action with the wool. The speed of addition was of no account.

Mr. Kaiser recalled cases where sour dyes on ladies' dress goods were dyed from a standing bath four sets a day for three weeks, with satisfactory results. No addition except dye was made. The goods were Bradford finished.

Mr. Durfee asked if the bath exhausted. Mr. Kaiser replied that it did not.

Mr. Bannan confirmed Mr. Kaiser's statement from his own experiences where standing baths were maintained for long periods. Mr. Bannan also spoke of some of the old methods (which sometimes gave even goods) of carbonizing. The belief then was that rapid drying by heat gave the desired results. He spoke of other cases where the direct contact of strong solutions of alkali with the cloth, as by throwing pailfuls into the washer, had subsequently given streaky dyeings.

Mr. Bannan hoped that some future meeting might be related to carbonizing and also wool oils other than olive oil.

Mr. Durfee moved for adjournment at about 8.45 p. m.

The meeting gave a rising vote of thanks to the speakers for their kindness, and was adjourned.

A. K. JOHNSON, Secretary.

THE DEVELOPMENT OF TESTS FOR THE FASTNESS OF DYESTUFFS

By WALLACE J. MURRAY

(Concluded from page 52 of Proceedings, March 27, 1922.)

CHEMICAL TESTS

In 1912 Bancroft proposed the testing of dyed fabrics with hydrogen peroxide as a measure of light fastness. He claimed that the effects of light and hydrogen peroxide were comparable.

TESTS FOR FASTNESS TO WASHING

Unlike the tests to determine fastness to light, it is easy to control conditions in determining fastness to washing. The main question arising in washing tests is how severe a test should be used.

In the early tests only the method of washing the fabric was specified. Since it was found that no two persons would carry out a test in exactly the same manner, it was necessary not only to specify the treatment but also to compare the sample with standard dyeings of known fastness.

The table at the end of this paper gives a summary of the more important tests which have been recommended, and therefore there is no need to consider them further here.

TESTS OF FASTNESS TO PERSPIRATION

Perspiration is very variable. Sometimes it is acid, other times it is alkaline. It varies in different persons and animals, and varies in the same person or animal at different times.

Perspiration tests fall into two groups: tests with real perspiration and tests made with solutions to resemble perspiration. Chemical solutions for perspiration tests are often acid, but neutral and alkaline ones have been recommended. They are summarized in the table at the end.

TESTS OF FASTNESS TO OTHER AGENCIES

The varieties of fastness are always increasing. In 1898 Hertzfield listed seven types; Lange in 1903 listed twelve types; while the "Echtheitskommission" in 1916 listed nineteen types. Among the more important of these are fastness to water, ironing, and rubbing. For a discussion of these tests the original articles should be consulted (see bibliography previously published).

At the present time our society is working on standard tests for fastness. The writer hopes that this brief review of the work which has been done in the past may be of service to us in establishing our standards for the future. (Tables referred to on opposite page.)

Proceedings of the American Association of Textile Chemists and Colorists

SUMMARY OF FASTNESS TESTS

FASTNESS TO LIGHT

Date	Authority	Light	Measurement	Time	Fiber	Standards or Method of Expression
1867	Ure's Dictionary	Sun	None			None
1898	Herzfield	Sun	Standards	Until altered		Medium indigo or turkey red
1900	Dosne	Sun	Actinometer	Until altered		Rate of distillation from black to white bulb
1903	Lange	Sun	Standards	Until altered	All three	Various depths of fast dyes of same color as sample
1907	Meister, Lucius and Brunig, C'ton Dyeing	Sun	None	1 mo. to 1 day	Cotton	Number denoting time
1911	Krais	Sun	Standards	Until altered		Paper coated with clay and Victoria blue
1914	G. Schultz	Sun	None	1 mo. to 1 day	All three	None
(1920 rep.)	Farbstofftabellen					
1914 & 1916	Echtheitskommission	Sun	Standards	Until altered	Cotton	1. Chicago Blue 2. Methylene Blue 3. Indoin Blue 4. Kryogene Violet 5. Benzo Fast Red 6. Hydrogen Blue 7. Sulphur Black 8. Indanthrene Blue
					Wool	1. Indigtine 1A 2. Ponceau RR 3. Amaranth 4. Azo Acid Red 5. Acid Violet 6. Diamine Fast Red 7. Anthraquinone Green 8. Indigo or Naphthalin Green B

FASTNESS TO WASHING

Date	Authority	Grade	Concentration in Grams per Liter: Soap	Soda Ash	Fiber	Time Min.	Temp. °F.	Treatment	Standards
1867	Ure's Dictionary		Used	None			0	Wash	None
1898	Herzfield	Mild	5	None		20	105	Rub at first, soak, rinse and dry	None
		Severe	5	None		20	130		
1903	Lange	Mild	5	3	Cotton		Warm		
		Severe	5	3	Cotton	120	Boil		None
			5	3	Wool	60			
			5	None	Silk		104		
1907	Meister, Lucius and Brunig	Mild	2	None	Cotton	30	140		None
		Severe					212		
1911	Heermann	Mild	5	3	Cotton	15	140		None
		Severe					212		
1914	Schultz	Mild	2	None	Cotton	30	140		None
		Severe					212		
(1920 rep.)	Farbstofftabellen	Mild	2	0.5	Wool	15	140		
		Severe					212		
1914 & 1916	Echtheitskommission	Mild	2	None	Cotton	30	105	Soak, squeeze out 10 times, rinse, dry	1. Benzopurpurine 2. Primuline 3. Indoin Blue 4. Immedial Indone 5. Alizarine Red
		Severe	5	3	Cotton	30	212		
		Mild	10	0.5	Wool	15	105	Knead, squeeze, rinse, dry	1. Orange II 2. Patent Blue 5. Palatine Ch'me. Blk.
		Severe	10	0.5	Wool	15	175		

FASTNESS TO PERSPIRATION

Date	Authority	Solution	Fiber	Manipulation	Standards
1898	Herzfield	6 c.c. 30 per cent acetic acid per liter of water		Dip at 100° F., rub, dry without rinsing at 68-77	None
		None		Place under saddle	None
1903	Lange	None	All three	Wear on chest or under arms	None
1904	Davidis	5 grams soap and 3 c.c. ammonia per liter		Soak 10 min., squeeze dry	None
1907	Meister, Lucius and Brunig	50 acetic acid per liter	Cotton	Treat 1 hour at 104° F.	None
1914 (1920 rep.)	Schultz	50 grams of 8° Be. acetic	Cotton	Treat 1 hour at 104° F.	None
1914 & 1916	Echtheitskommission	5 c.c. 30 per cent ammonium acetate	Cotton	10 min. at 175° F., dry without rinsing	1. Chrysophenine 3. Diamine Black 5. Indanthrene Blue
		1. Same as cotton 2. 100 grams salt per liter	Wool	1. Same as cotton 2. Spot, dry, brush off	1. Azo Yellow (method 1 only) 3. Amaranth 5. Palatine Ch'me Blk.

Proceedings of the American Association of Textile Chemists and Colorists

NOTICE FROM THE SECRETARY

APPLICATIONS FOR MEMBERSHIP IN THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

All individuals who believe that they are eligible for membership in the Association and are desirous of affiliating with the organization can communicate with the Secretary, who will gladly furnish application blanks and extend to them every possible assistance.

It is desirable that members of the Association should make an effort to interest all those who they believe would make desirable members.

The Secretary will at all times be pleased to provide members with as many application blanks as may be desired.

W. E. HADLEY, Secretary,
5 Mountain Avenue, Maplewood, N. J.

CHANGES OF ADDRESS

The following changes and corrections in names and addresses of members should be noted:

E. M. GLENNON
80 Mechanic Street, Westbrook, Me.

NOTICE OF MEETINGS

The next meeting of the Council will be held Friday, May 12, 1922, at the Engineers' Club, Boston, Mass., at 4 p. m.

A meeting of the Research Committee will be held at the same place at 4.30 p. m. of the same day.

Members wishing to bring any matters to the attention of these meetings will please communicate with either the President or the Secretary.

Electrometric Titration as a Means of Determining the Free Sodium Sulphide in a Sulphur Black Dye Bath[1]

By W. WALKER RUSSELL
with SAMUEL T. ARNOLD

THIS work[2] was undertaken with the idea of finding a quick and accurate method for determining the free sodium sulphide content of a standing sulphur black dye bath. It is of importance to have a means of determining the sodium sulphide content of a standing sulphur dye bath in order that the dyestuff, which has precipitated on standing, may be again brought into solution, ready for dyeing, by the addition of a suitable amount of sodium sulphide. By means of the electrometric method to be described it is possible to ascertain the per cent of sodium sulphide present in a bath at any time and, knowing this, sodium sulphide may then be added to give the desired concentration.

Several methods have previously been offered for this determination, among which is that of R. N. Len,[3] which involves the preliminary precipitation of the dissolved dye, or its absorption by cellulose; also that of H. Swann[4] in which the hydrogen sulphide evolved from the dye bath is distilled into standard iodine solution. In the latter method, however, the presence of sodium sulphite, as an oxidation product of the sulphide, has been shown to affect the amount of hydrogen sulphide evolved.

By the use of electrometric titration, the intention was to eliminate the necessity of precipitating the dye, or of a distillation, and also of an outside indicator.

The electrometric apparatus used is essentially that described by H. S. Roberts,[5] and was built by the writer at this laboratory. To those who may be interested in an apparatus of this type, it may be said that with the material at hand in the commercial laboratory, it should be possible to build a satisfactory apparatus for about $30. This represents the cost of the new materials needed. The apparatus consists principally of two electrodes (one platinum, and the other a calomel half cell), which are immersed in the solution to be titrated. The E.M.F. of the cell thus formed is balanced, with the aid of a galvanometer, by means of a sliding resistance coil against two dry cells. An arbitrary value of the resistance employed is given by a scale of equal parts placed beneath the slide bar of the resistance coil. Changes in the concentration of the cell formed by the two electrodes dipping into the solution during titration, are indicated by movements of the galvanometer needle. The largest permanent deflection of this needle is taken as indicating the end point.

Iodine was selected as the most suitable oxidizing agent for the determination of the sulphide ion, as previous work by the writer with iodine, using the electrometric apparatus, had shown this apparatus to be even more delicate than starch solution for locating end points in iodimetric titration.

(To be concluded.)

[1] This paper is an abstract of work done by W. W. Russell in partial fulfillment of the requirements for the degree of Master of Science at Brown University, 1920.

[2] Acknowledgment is made to W. H. Cady, of the U. S. Finishing Company, for suggestions in this work.

[3] R. N. Len, "Dyers & Colourists' Journal," No. 30, 1914, page 277.

[4] H. Swann, "Dyers & Colourists' Journal," No. 33, 1917, page 146.

[5] "Journal of the American Chemical Society," Vol. XLI, No. 9, September, 1919. Electrical apparatus for the use in electrometric titration.

NOTES ON HYPOCHLOROUS ACID AND CHLORINE, WITH COMPARISONS OF THEIR BLEACHING ACTION

(*Continued from page* 330.)

persists very strongly. The solution also gives only a slight precipitate with silver nitrate, which, however, rapidly increases in amount. The reaction—

$$H_2O + Cl_2 \rightarrow\leftarrow HOCl + HCl$$

has evidently not proceeded very far from left to right even when the color has disappeared. The addition of silver nitrate to the solution causes the immediate removal of the hydrochloric acid, and then the reaction proceeds to a finish, all the chlorine disappears, and the solution smells of hypochlorous acid. (For a description of further changes in this solution see previous pages.)

Even when chlorine water is diluted with fifty or a hundred times its volume of water, so that it becomes N/500 or N/1,000, the solution smells distinctly of chlorine, and experiments on the bleaching action of these very dilute solutions also show that they contain a considerable proportion of free chlorine.

With very dilute solutions such as these, experiments on the activity of bleaching of chlorine and hypochlorous acid can be made much more satisfactorily than with stronger solutions, as their action upon such a coloring matter as Indigo, for example, is sufficiently slow to enable reliable comparisons to be made. Many comparative experiments have been made (generally using a dilute solution of Indigo-sulphonic acid, but also with other coloring matters) with solutions of chlorine and hypochlorous acid diluted to N/500, and the chlorine invariably bleaches more rapidly than the hypochlorous acid. Thus, while 20 cc. of the solution of chlorine bleached a measured volume of the Indigo solution in fifteen to twenty seconds, the hypochlorous acid always took two or three times as long. Similar differences in the time of bleaching were observed with Cochineal, Crystal Violet, infusion of Red Rose leaves, and Litmus; (the curious action of very dilute chlorine water upon Litmus will be described later).

The bleaching action of dilute chlorine water is considerably accelerated by the addition of hydrochloric acid, which reverses the action of the chlorine on the water, thus liberating more chlorine. Naturally, also, the addition of hydrochloric acid to dilute hypochlorous acid accelerates its bleaching action in the same way. In fact, according to the reversible action—

$$HOCl + HCl \rightarrow\leftarrow H_2O + Cl_2$$

the addition to hypochlorous acid of just the right amount of hydrochloric acid ought to produce a mixture which would behave exactly like dilute chlorine water. If a solution of N/500 hypochlorous acid is mixed with half its volume[3] of N/500 hydrochloric acid, the resulting mixture, in its bleaching action, appears to be absolutely identical with N/500 chlorine water mixed with half its volume of water (to bring it to the same volume as the mixed acids). The two solutions bleach at exactly the same rate.

Other acids than hydrochloric do not stimulate the bleaching action of this very dilute hypochlorous acid, as they do with the stronger solutions (see previous reference). In fact, as already pointed out, the solution of Indigo used in comparing the times of bleaching was a solution in sulphuric acid.

The results of the comparative bleaching experiments above described leave no doubt that, considered simply as a bleaching agent, chlorine is more active than hypochlorous acid.

S. H. Higgins, however, in various papers (*Chem. Soc. Trans.*, 1912; *J. S. D. C.*, 1912, etc.), and more recently in his book on Bleaching,[4] insists that "chlorine is a comparatively weak bleaching agent," and that, in practically all cases of bleaching by hypochlorites, hypochlorous acid is the active agent. His conclusions were drawn from the fact, which he pointed out in 1912, that linen is hardly bleached at all by chlorine. In a paper published by the author, *J. S. D. C.*, in April, 1912, entitled "The Action of Bleaching Agents in the Colouring Matter of Linen," it was pointed out that not only has free chlorine very little effect on the coloring matter of linen, but that that coloring matter is equally unaffected by pure hypochlorous acid. The conclusion arrived at was that most of the coloring matter of linen is abnormal in its behavior with bleaching agents, and that, in order to enable either chlorine or hypochlorous acid to bleach linen, it was necessary to add a certain amount of alkali as well; that, in fact, while neither of those substances alone will bleach linen, a hypochlorite will. As a solution of bleaching powder contains a hypochlorite, it will, naturally, bleach linen.

In a further paper (*J. S. D. C., March*, 1914) on "The Action of Bleaching Agents on Various Natural Colouring Matters," it was pointed out that the anomalous behavior of the coloring matter of linen was shared by a part of the coloring matter of cotton, and by the coloring matter of jute. Nearly all the experiments on bleaching which Higgins has described have been done with unbleached linen, and it is plain that little reliance can be placed upon conclusions as to the bleaching activity of chlorine and hypochlorous acid which have been drawn

[3] While a normal solution of hydrochloric acid contains 36.5 grms. per liter, a normal solution of hypochlorous acid (measured by its oxidizing power) would only contain HOCl ÷ 2 = 26.25 grms. per liter, so that a given volume of N/500 hydrochloric acid would contain twice as many molecules as the same volume of N/500 hypochlorous acid. Consequently, if the two dilute acids were mixed in equal volumes the resulting mixture would not behave like chlorine water, but like chlorine water to which some hydrochloric acid has been added.

[4] "Bleaching," by S. H. Higgins, 1921. Manchester University Press.

from experiments made with a coloring matter which is unaffected by either of them.

But Higgins continues to state that linen is bleached by hypochlorous acid, and, as a proof of this, he mentions two experiments. In the first he simply added boric acid to a solution of bleaching powder and found that the mixture bleached linen. Now such a mixture would certainly contain both hypochlorous acid and free chlorine, but it would also contain a considerable amount of unaltered calcium hypochlorite, and it is this which bleaches the linen. If the hypochlorous acid were distilled off from the mixture, the pure substance so obtained would not bleach linen.

In his second experiment Higgins added hydrochloric acid to a solution of bleaching powder until it turned yellow owing to the liberation of chlorine; he then divided the solution into two parts, and to one added precipitated calcium carbonate (to produce hypochlorous acid). He placed some boiled linen in both solutions and found that the one to which the calcium carbonate had been added the far greater action (Higgins, *J. S. D. C.*, July, 1914). Here again the experiment is rendered worthless as evidence of the superior bleaching power of hypochlorous acid by the fact that pure hypochlorous acid was not used. This experiment has been repeated, but instead of putting the boiled linen into the mixture, the hypochlorous acid was distilled off before use, with the result that the bleaching action was very slight indeed. It was further found that if hypochlorous acid, prepared either as just described or by distilling dilute bleaching powder with boric acid, is mixed with a little precipitated calcium carbonate, this has the same effect as the addition of a little alkali, and enables it to bleach linen. It has been pointed out that to enable either chlorine or hypochlorous acid to bleach linen some hypochlorite must be present as well, and it is evident that by the addition of calcium carbonate to either chlorine water or hypochlorous acid the requisite amount of hypochlorite is produced.[5] Thus the bleaching of the linen in Higgins' experiments is fully and satisfactorily accounted for, and their evidence as to the superior bleaching activity of hypochlorous acid is of no value.

In order to account for some of his results, Higgins has recourse to what he calls "latent" chlorine. But this is unnecessary in view of the fact that the coloring matter of linen (together with part of that of cotton and of jute) is abnormal with regard to the action of bleaching agents.

The Action of Very Dilute Chlorine Water on Solution of Litmus

When 40 to 50 cc. of very dilute chlorine water (5 to 10 cc. of freshly prepared chlorine water to a liter of water, when the solution would be from N/2,000 to N/1,000) are added to a few cc. of Litmus solution, also freshly made, the liquid at once becomes bright red, but in a few seconds the color changes to purple, and then, if sufficient chlorine water is presently, slowly disappears.

The condition of equilibrium in the chlorine water is represented by the equation—

$$H_2O + Cl_2 \rightleftarrows HOCl + HCl,$$

and the bright red color which is produced at first is caused by the hydrochloric acid present in the solution, as hypochlorous acid has very little, if any, reddening effect upon Litmus. Plainly, when the color has changed to purple, the hydrochloric acid has disappeared from the solution. A probable explanation of this disappearance of the hydrochloric acid appears to be that the free chlorine in the solution is immediately used up in bleaching some of the Litmus, and, as it disappears, the reaction represented above is reversed and the hydrochloric acid also disappears, producing with the hypochlorous acid more free chlorine, which is used up in bleaching the coloring matter.

If this explanation is correct, then plainly the time-honored explanation of the bleaching action of chlorine (the decomposition of water by the chlorine and the consequent formation of hydrochloric acid) cannot be correct—in the case of the bleaching of Litmus at any rate. Apparently the chlorine itself acts directly upon the coloring matter.

This experiment also yields an additional proof of the superior bleaching activity of chlorine over hypochlorous acid. If the latter, and not the chlorine, first attacked the coloring matter, and the amount of hypochlorous acid in the solution diminished, this would disturb the equilibrium of the solution in the opposite direction, and so more hypochloric acid would be produced. Also, hypochlorous acid, when it bleaches, actually yields hydrochloric acid, and this would add still further to the amount of that acid in the solution.

From the results of the experiments described in this paper, it seems plain that the active bleaching properties generally attributed to hypochlorous acid are for the most part imaginary, and are not characteristic of the pure substance itself.

Discussion

In the discussion which followed, S. H. Higgins said he thought that Mr. Taylor and himself had been working on rather different lines. Mr. Taylor admitted that chlorine had little action on the coloring matter of linen, and the bleaching of this coloring matter was of more interest than the bleaching of Indigo. Although in the case of the cotton fiber there was less coloring matter present, and it was not possible to observe the distinction so well, all the results obtainable with linen were obtainable with cotton. Other observers have supported the statement that hypochlorous acid is the best bleaching

[5] Since the above was written I have found that if hypochlorous acid (about N/10) is shtaken up for some time with precipitated calcium carbonate, some of the latter is dissolved. If the solution is filtered, the clear liquid gives a considerable precipitate with ammonium oxalate, showing the presence of calcium in it. Hypochlorous acid has generally been considered too weak an acid to decompose calcium carbonate.—R. L. T.

agent for textile fibers. With regard to the tests with Turkey Red and Indigo, he (the speaker) had already conceded the point that chlorine was the best bleaching agent. With regard to the boric acid and bleaching powder solution, after adding the boric acid the solution, after adding the boric acid the solution was colorless. Therefore there was no chlorine present.

R. L. Taylor said his statement was that if boric acid was added to a solution of bleaching powder, both hypochlorous acid and chlorine were formed. In a former paper he had described the experiment of sending air through a solution of a mixture of boric acid and bleaching powder and driving out from it both chlorine and hypochlorous acid. The quantities obtained were given.

Mr. Higgins said that when there was no coloration in the solution it could not be said that chlorine water was obtained. When acid was added to a solution without any yellow color resulting, he thought it could be concluded there was no free chlorine present.

J. R. Hannay thought they would all admit that the real bleaching agent was oxygen, and not either chlorine or hypochlorous acid. The question was which was the best intervening agent to use—chlorine or hypochlorous acid—in order to activate the oxygen. Mr. Taylor seemed to have advanced pretty conclusive evidence that chlorine, under given conditions, was a much more active agent in liberating the oxygen which was required to perform the bleaching. With regard to the decomposition of hypochlorous acid in the presence of silver nitrate, surely when silver nitrate was added to a hypochlorous acid solution, and there was a gradual decomposition with a deposition of chloride of silver, there was freed in the solution a certain amount of nitric acid which acted as a strong oxidizing agent on the hypochlorous acid left in the solution. Apparently Mr. Taylor quite overlooked that part of the reaction with reference to his experiment with hypochlorous acid and silver nitrate.

The lecturer remarked that the solutions were really too dilute for nitric acid to have any oxidizing effect, being only decinormal solutions to begin with.

Mr. Hannay could hardly agree with Mr. Taylor's statement. He thought that with a strong odixidizing agent like nitric acid the action of the acid would be proportional to the strength of the solution.

Mr. Taylor said that the hypochlorous acid was itself an oxidizing agent under certain conditions.

Scouring and Milling

Classification of Methods—Scouring Methods—Saponification Scour—Fancy Worsteds Scour—"Low-Goods" Scour—Guidance from Hypothetical Cases

By J. SCHOFIELD, B.Sc., A.R.C.Sc.

From a paper read before the South of Scotland Section of the Textile Institute, and printed in the "Journal" of the Institute

IT is possible to classify the various methods of textile scouring in more than one way. On the wool side of the textile industry, piece scouring might be divided, according to the materials worked on, as: (1) Scouring of high-grade woolens; (2) scouring of worsteds; (3) scouring of low-grade goods. These differ primarily in respect of the kind and quantity of oiling applied to the fabrics. Thus on the better class woolens there would be heavy oiling of, say, 10 per cent on the weight of the wool, and consisting of good quality wool lubricant containing in general much free fatty acid. Contrasted with these are the good quality worsted cloths carrying light oiling of 2 to 3 per cent, and of a neutral or nearly neutral type. In the low-grade goods the oilings are again heavy and of a worse type, often with large percentages of mineral oil; here, also, there are the special difficulties of these fabrics to be detailed later.

1. Solvent scouring, in which oily and fatty matters are extracted from the fiber by the direct solvent action of benzene, petrol, etc.

2. Saponification scouring, in which the free fatty acids of the oils are converted into soaps in the scouring machine by the action of the alkali.

3. Emulsification scouring, in which the greasy dirt is removed mechanically by the formation of a frothy lather or emulsion; the wetting-out power of this lather causes the breaking up and detachment of the oil, etc., from the surface of the wool fiber. This is obviously a physical process as contrasted with the chemical process of scouring by saponification.

These methods are ideal statements of types of scouring to which practical methods conform more or less. Thus, most scouring of raw wool in the usual bowls is of the emulsification type. The scouring of fancy worsteds by weak alkali and some soap is a further example of emulsification working.

On the other hand, good woolens carrying oil with large percentages of free fatty acids may be scoured throughout—and well scoured—by alkali alone; sufficient soap is formed in the machine to use up the oiling both directly as soap and indirectly as emulsion. This is a typical saponification scour. The scouring of low-

grade goods has usually to be of a composite kind, which we shall consider later.

Saponification Scour

It is most useful to discuss first the saponification scour, as it well illustrates the principles concerned, is scientifically justifiable at all stages, is easy to carry out in practice, and, finally, is thoroughly efficient in its results. It is completely described on page 120 *et seq.* of the author's book on "Scouring and Milling" as a standard scour on heavily oiled woolens. It is an obvious truism that the oiling for wool lubrication at the spinning end and the subsequent scouring operations must be intimately connected. In the present case of good woolens it is assumed that the spinning oils are the usual "oleins"—i. e., crude oleic acid of high saponifiable quality with some mineral oil; say, 20 per cent—commonly employed in the trade. In this case the wool oils will have large amounts—possibly 40 to 60 per cent, or even more—of free fatty acids; that is, these fatty acids will not be combined, as in the neutral animal and vegetable oils, with glycerine, but are free to enter into chemical union with the soda carbonate to form soap. This is a reaction which is possible at moderate temperatures, and hence the scouring of such goods is quite practical by alkali alone as follows:

Stage 1.—Run in soda ash solution of 5 to 6 deg. Tw. at about 90 deg. Fahr., using, say, 20 gallons per 100 pounds of wool. Let this saponify, running for ten minutes or so, and then without addition of water open the sud box and let the dirty emulsion away to the drain. When the machine is thus emptied—

Stage 2.—Add alkali as before, about 5 gallons per 100 pounds of wool, scour for twenty minutes or so, and—

Stage 3.—Wash down; warm water at first, and slowly, then stronger and colder.

The principles of this saponification two-stage scour are:

1. Attack by alkali on the free fatty acids of the spinning lubricants with formation of soap.

2. The resulting emulsification detaches the superficial dirt of the fiber, and this is removed at an early stage from the machine.

3. This stripping action is intensely assisted by the generation *in situ* of carbonic acid gas by the action of the fatty acids on the alkali in forming soap—an extremely powerful detergent factor peculiar to saponification as contrasted with purely emulsification scouring.

4. The use of a clean and unexhausted scour, of good diffusibility, for the deeper penetrated dirt of the fiber, which requires longer continued action for its saponification and emulsification. It must be remembered that colloids do not diffuse through colloids; soap as soap is not a penetrant of the wool fiber. But a crystalloid substance like soda carbonate possesses high diffusibility and can pass into the actual tissue. The method here described is probably the most efficient of all scours on wool goods in point of cleanliness in the resulting fabric. Seeing that much of the free fatty acid of the wool oil is oleic acid, the resulting soap formed in the machine is a sodium oleate. Such soaps are known to be particularly soluble at comparatively low temperatures, hence their scouring properties are enhanced, and, further, their easy removal from the fabric is assured. It is instructive to consider this scour as an ideal to be followed as far as practicable in other cases.

Consider now the scouring of high-class worsteds. Here the oiling is not only much lessened in quantity but is usually of a more neutral character. Now, the saponification of a neutral oil, even when of animal or vegetable origin, cannot be effected by carbonated alkalies at ordinary scouring temperatures. Hence a straightforward saponification scour is not feasible on these goods, and the usual process is as follows:

Fancy Worsteds Scour

Alkali of 2 to 4 deg. Tw., in accordance with the reduced oiling, together with some soap from the outset, the idea being to work up an emulsion which, by diminished surface tension or increased wetting-out capacity, will detach the oil and dirt and float them away from the fabric.

It would be interesting to know the practical reasons, if any exist, why worsted spinners do not use oils with large fatty acid content, as do their brethren on the woolen side. The addition of small amounts of free fatty acid to mineral oil for machine lubricants has been found to increase their efficiency, diminishing the friction in some cases to one-half that of mineral oil alone. In the textile case, the presence of free fatty acids enormously facilitates the work of the scourer, and it is therefore important to know what are the objections on the worsted side. It is, however, an actual fact that many worsted "oleines" contain moderate percentages of such acids. In these cases it is possible and often superior in practice to conduct a worsted scour thus:

1. Run on alkali 2 to 4 deg. Tw., warm, for ten minutes, and then, without any addition of water, lead this off to the drain.

2. Add more alkali—preferably weaker—and some soap, and complete the scour.

3. Wash off, warm and gently at first, colder later.

It must be noted that overstrong alkali solutions prevent the proper solution of the soap; it is far preferable to work with weaker solutions and in more than one stage.

The "Low-Goods" Scour

In this class of trade the unfortunate scourer meets

with all his difficulties in their worst forms. There may be excessive bleeding of color due to loose dyeings, poor dyestuffs, dyeing in the grease, etc., low grade oilings often with much mineral oil, sizings, recovered wools, flock wastage, and the rest. In many cases the conditions to be met are incompatible—e. g., the necessity of scouring at low temperatures to prevent bleeding, thus losing the advantage of the decreased surface tension (i. e., enhanced wetting-out power) of a warm scour.

The surface tensions of water at various temperatures are given in a paper in "Science Abstracts," October, 1921:

Temperature	Surface Tension
0 deg. Cent.	76.7
18 " "	75.6
36 " "	70.0
69 " "	64.8
89 " "	60.9

Thus, taking 36 deg. Cent. or 97 deg. Fahr. as a scouring temperature, there would be a gain of nearly 10 per cent in lowered surface tension as compared with ice-cold water. Perhaps, however, the bleeding of color must be prevented even at the expense of some perfection in the scour.

The low-grade oilings offer in these goods the maximum of difficulty. There is often much mineral oil, which tends to prevent the formation of proper emulsions, and, being itself unsaponifiable, is removable only by a process of emulsification. There is usually an undue proportion of other unsaponifiable matter and a corresponding lack of free fatty acids; a sufficiency of these would in many cases simplify the scouring of the goods, enabling at any rate the first stage of a saponification scour to be effected. Many so-called "black oils" are excellent from the scourer's point of view owing to their high content of free fatty acids; much of the scouring of low-grade goods would be vastly improved by a judicious addition of suitable black oil to the spinning lubricant. It is undoubtedly desirable that wool oils should be specified in terms of free fatty acid, in addition to—or in place of—total saponifiable matter. It is free fatty acid, and not merely neutral saponifiable oil, which is of primary importance at the scouring end.

It is, therefore, not possible at present to lay down the exact lines of a low-goods scouring operation. If the oiling can be modified in the direction of securing a proper quantum of free fatty acids, then a two-stage scour of the following type may be practised:

1. Run in warm alkali 5 to 6 deg. Tw. if the colors do not bleed; otherwise, cold. Scour from ten to fifteen minutes, and, without added water, open the sud box and pass this away to the drain.

2. Add further alkali, weakened, together with some soap, to build up an emulsion; scour out.

3. Wash down, preferably with warm water at first, if the dyeings will permit.

There are some special points in the practice of low-goods scouring which merit further discussion.

It is possible that slight additions of caustic soda to the first stage of the scour may be found useful. Caustic as against carbonated alkali will saponify free fatty acid in the cold; it is, further, more active in the softening of possible hardness in the water. But the concentration of such caustic alkali must be small in view of its strong tendering action on the wool fiber; a strength of perhaps not more than 2 ounces in 10 gallons of the scour may be tried. Further experiments are necessary. Ammonia in scouring is invariably used in the form of hydrate and never as carbonated alkali.

Another question bearing on the low-grade scour more particularly is the use of the so-called "solvents." There are a number of substances capable of dissolving oil or grease quite freely—e. g., ether, chloroform, carbon bisulphide and tetrachloride, alcohol, benzine, petrol, turpentine, and certain chlorinated hydrocarbons such as trichlorethylene and tetrachlorethane. When the various physical and chemical properties of these bodies are compared, it is seen that only a few —viz., alcohol, carbon, tetrachloride, tetrachlorethane, etc.—are adapted for employment as adjuncts to a textile scour. And it further appears that their true utility is not the dissolving of oil or grease, but their property of lowering the surface tension of the scour. If experiments by the drop pipette or by soap bubbles are conducted with solutions containing these bodies, it will be found that there is a reduction of the surface tension of the scouring liquor beyond that attained by the use of soap. Hence, there is scientific justification for their use under proper conditions, and further experience is necessary to determine which substance, and under what conditions, the highest efficiency is obtained. Other things being equal, the property of perfect miscibility with water possessed by a substance like alcohol is to be desired as against bodies like tetrachlorethane, which require emulsifying agents such as sulphonated oils to assist their dissemination throughout the scouring liquor. The whole question is one requiring further investigation.

Guidance from Hypothetical Cases

Some useful notions respecting the principles of scouring and the proper modes of procedure may be gained by considering certain extreme cases not necessarily met with in practice. Suppose fabrics lubricated as follows:

1. Oiled with pure mineral only.
2. Oiled with pure neutral animal or vegetable oil only.
3. Oiled with pure free fatty acids only.
4. Lubricated with dilute glycerine.

Taking the last case first, a simple steeping and working in warm water would cleanse the fabric. The cloth oiled by free fatty acid could be completely scoured by the use of alkali alone. The fabrics having either mineral oil or neutral glycerides would require soapy emulsions, perhaps repeated several times; or, alternatively, extraction by solvents.

There are many other points in scouring theory worthy of close attention. The subject of detergent materials is in itself a wide one, embracing such questions as—

1. The proper strength of alkali solutions; and of soap solutions.
2. The temperature of scouring.
3. The best kinds of soaps for textile work.
4. The function of ammonia in the scour, and its utility.
5. The limits of mineral oil in wool lubrication; the penetration of such oils as compared with oleins, etc., into the fiber tissue.
6. The use of resin, silicate of soda, etc., in soaps.
7. The limits of hardness of water for textile purposes.
8. The consistency of the scour: should a scouring liquor be thick and creamy, or thin and sloppy?

Foreign Trade Opportunities

Reserved information may be obtained from the U. S. Bureau of Foreign and Domestic Commerce and its district and co-operative offices by duly registered firms and individuals upon written request by opportunity number. The Bureau does not furnish credit ratings or assume responsibility as to the standing of foreign inquirers; the usual precautions should be taken in all cases, and where no references are offered it does not necessarily imply that satisfactory references could not be given. Correspondence may be in English unless otherwise stated. Symbols: *Reported by American consular officers; †Reported by commercial attaches and trade commissioners; ‡Direct inquiries received by the Bureau.

1394.‡—A commercial agent in Australia desires to secure the representation of firms for the sale of silk goods. No reference offered.

1367.*—A merchant in Arabia desires to purchase and also secure an agency for unbleached piece goods, drills, and jeans. Quotations should be given c. i. f. port of Arabia. References.

1357.*—A firm in Wales which caters to the steamship service desires to purchase ship stores of all kinds, foodstuffs, ship tackle, oils, canvas, paints, hardware, etc. Quotations should be given c. i. f. Welsh port. Reference.

1358.*—Agencies are desired by firms in Italy for the sale of raw cotton in bales. Quotations should be given c. i. f. Italian port. References.

1359.*—A mercantile firm in Australia desires to secure agencies from manufacturers for the sale of hardware, groceries, plated goods, and textiles. Quotations should be given c. i. f. Australian port. Terms: Cash against documents. References.

1517.*—The purchase is desired by a furniture company in Canada of upholstered furniture, in tapestry and leather; walnut, mahogany, and quartered-oak bedroom suits; tapestries, cretonnes, etc., for furniture coverings and draperies; floor coverings; kitchen cabinets; and electric sweepers. Quotations should be given f. o. b. Boston. References.

1428.†—A mercantile firm in Australia desires to secure an agency from manufacturers for the sale of silk piece goods, for which there is a good market in that country. Terms: Cash against documents in New York.

1430.*—An agency is desired by a firm in Italy for the sale of mixed cotton and silk cloths (prints), cotton and silk hosiery, and velvet. Quotations should be given c. i. f. Italian port. References.

1432.*—A general agency is desired by a merchant in Switzerland for the sale of novelties in electric machinery, raw cotton, cotton cloth, and foodstuffs such as rice, coffee, and canned-meat products. References.

1475.†—A firm of manufacturers' agents in South Africa desires to secure the representation of firms for the sale of cottonades. Reference.

1477.‡—The purchase is desired by a firm in India of piece goods of every description, millinery, hosiery, perfumery, etc. Quotations should be given c. i. f. port of India. Reference.

1478.*—There is a market in Italy for toilet articles in general, soap, perfumery, brushes, and household hardware. Quotations are requested c. i. f. Italian ports. References.

1479.*—A mercantile firm in Canada desires to secure an agency for the sale of novelty specialties, silk goods, ribbons, neckwear, velvets, laces, curtains, ready-to-wear lines, and specialties in hardware, drug, and grocery trades. Quotations should be given f. o. b. factory.

1509.‡—A sales-agency firm in South Africa desires to secure the sole agency of firms for the sale of hosiery,

boots and shoes, toilet requisites, cotton goods, hardware, and general merchandise. Reference.

1511.*—An agency is desired by a mercantile firm in Ireland for the sale of oilcloths and rubber shoes. Quotations should be given c. i. f. Belfast and Dublin. Reference.

Recent Patents

Knitting Machine

(1,406,253; February 14, 1922)

HERBERT T. BALLARD, Norristown, Pa.

This relates to a new fabric and to the method and means for making the same. The invention is carried out on a rib knitting machine with multiple feeds. Changes are made in the stitch—say, from plain to tuck and from tuck to plain—and these changes are made to advance in position around the fabric in one direction at one feed as the courses are knit at this feed, whereas at another feed, and consequently in different courses, the said changes are made to lag and thus these changes take place spirally around the fabric, one change making the spiral advance in certain courses from wale to wale or groups of wales, while the other changes make the spiral lag in the other courses and from wale to wale or groups of wales.

The illustration is a front view, developed, of a number of feeds, including the improved mechanism.

The figure 1 indicates the cylinder and 2 the dial of a rib knitting machine.

There are shown ordinary feeds at A, B and special feeds at C, D.

At each of these feeds there is a thread guide 3 of ordinary form.

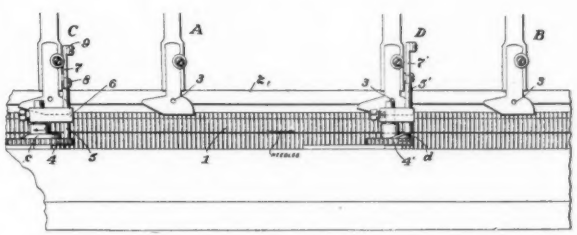
At feed C is mounted a toothed wheel 4, the teeth of which mesh with the needle stems and the wheel is therefore rotated. If the cylinder has 324 needles, the number of teeth in the wheel is made such that it is not an exact divisor of the number of needles in the cylinder. For instance, the number of teeth in the wheel is sixty-five. This will not divide exactly into the whole number of needles in the cylinder; but, on the contrary, there will be one needle less than the number required to make the number of needles a multiple of the number of teeth, and thus for each revolution of the needle cylinder the revolution of the toothed wheel 4 will not synchronize therewith, in the sense that the revolutions will start on the same needle, but as in the case just mentioned, where there is one needle less than the number necessary to make a complete revolution of the wheel, said wheel will lag in respect to the revolution of the needle cylinder. This wheel carries cams in the form of segments standing up from the surface of the wheel. These cams alternate with intervening spaces so that the cam path is divided into four segments, two high portions alternating with two low portions. These cams operate to change the stitch from plain to tuck and from tuck to plain, and for this purpose a rod 5 rests on the cam path, it being guided vertically by a block or bracket 6. The upper end of this rod is designed to operate a lever 7 pivotally mounted at 8 to the yarn guide bracket and having a link 9 extending through a post extending through a slot in the dial cap and connected at its lower end with the ordinary wing cam of the dial set, this being the cam which, in ordinary practice, projects the needle to take the new yarn.

When the rod 5 is lifted the wing cam will be retired so that the needles will be projected only far enough to take the new yarn without causing the latches to shed the loops to a point back of them, and hence tuck stitches will be formed on these needles.

When the low part of the cam comes under the rod 5 the latter will fall and the wing cam will be drawn forward by a spring and the needles will be advanced to knit.

These changes, as above stated, will lag in respect to the revolutions of the cylinder, in the present instance one needle at a time, though inventor does not limit himself in this particular.

At the feed D, however, the wheel 4′ is provided with forty-six teeth to engage the needles, and as this



number divides into 324 unevenly, there being two needles over in the remainder, it follows that the wheel 4′ will be advanced a distance of two needles at each revolution of the cylinder, and hence the changes consequent upon the operation of this feed will be out of time with any given wale and may be said to advance in respect thereto. The wheel 4′ is provided with a single cam *d* extending over an angle occupied by twenty-three needles, it being one-half of the circuit of the wheel. This cam operates upon a rod 5′, which in turn operates a lever 7′ having a connection, similar to that described above, to the post of a wing cam.

The two plain feeds at A, B merely knit in the ordinary manner by casting off what loops there are on the needles and draw new loops. These feeds alternate with the special feeds above described. At this special feed D when the rod 5′ is lowered consequent upon the low part of the cam coming under it, ordinary knitting is done there.

In the resulting fabric, a diagonal of spiral striped formation is produced with the stripes running in opposite directions, and diamond-shaped formations at the intersecting points, this result being due to the lead and lag of the changes in the stitch and to the fact that the fabric at one feed is modified by the intermediate courses knit at the next feed.

By using different colored yarns at the different feeds the changes in the fabric are made pronounced in appearance.

The difference in the character of the stitches will also have the effect of distorting the courses and wales from straight lines and they will have the zigzag structure shown.

By using three feeds the wheel with sixty-five teeth would be used, also the forty-six toothed wheel and the feed B. The feed A would be omitted.

This machine will give one diamond block of the fabric structure in which the order of knitting in the courses would be one tuck, one knit, and one tuck. The second block would be made up of one tuck, one tuck and one knit, and the third block would have one course knit, one knit, one knit.

With the four-feed organization the order of the courses would be as follows: One block would have course one tuck, one knit, one tuck and one knit.

The second block would be one tuck, one knit, one knit and one knit.

The third block would have all the courses of ordinary knit stitch.

The sixty-five-tooth wheel makes approximately five revolutions to each course. As it has two cams, it will knit ten spaced apart plain portions in each course because the preceding feed B is a plain feed.

Between these plain knit portions the needles will take on a second loop, and these will be cast at feed A so that at this feed the tuck wales will be completed in the same course. This would give a diagonal tuck stripe and a plain knit stripe alternating but running diagonally one way if only these two feeds were used.

At the next feed D at which the smaller wheel is located, this wheel having forty-six teeth, will make approximately seven revolutions to one round of knitting, and as it has one cam there will be seven changes in the wing cam to knit seven times and to tuck seven times in one course.

The machine has 324 needles, as above stated. The wheel at feed C has sixty-five teeth. It has two cams; and as the number of needles is not a multiple of the number of teeth, the wheel changes its position with respect to the needle cylinder at each revolution of the latter, so that it will not start its series of revolutions per revolution of the cylinder on the same needle but, on the contrary, on the next needle.

This wheel may be said to lag in respect to the revolutions of the cylinder, there being one needle lacking in the cylinder, of a sufficiency to make its five revolutions even with those of the cylinder.

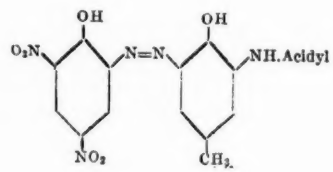
The fabric produced is the subject of another application, filed September 23, 1921.

Ortho-orymonoazo Dyes

(1,408,363; February 28, 1922)

WERNER LANGE, Berlin-Friedenau, Germany (assignor to Actien Gesellschaft fur Anilin Fabrication)

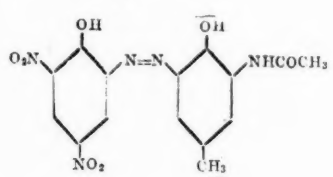
Describes new azo dyes derived from picramic acid and a 2-acidylaminophenol substituted by an univalent radical in the 4-position. The constitution of the new dyes in the free state may be expressed by the general formula:



X meaning an univalent radical.

The dyes furnish on wool with aid of chromium mordants olive-brown tints of an excellent fastness to washing, to milling, to potting and to light. They are in the shape of pulverized dry sodium salts dark powders, soluble in hot water with a brown coloration, becoming more reddish by the addition of soda lye. From the solution the dyes are precipitated in the form of brown flakes by an acid. Concentrated sulphuric acid dissolves the dyes to a red-brown solution. The dyes are destroyed by strong reducing agents yielding 2.4.6-triaminophenol and a 2-acidylamino-6-aminophenol derivative.

In order to illustrate how the dyes may be manufactured, the following example is given, the parts being by weight: 19.9 parts of picramic acid are diazotized as usual and coupled with a solution of 16.5 parts of 4-methyl-2-acetylaminophenol, alkaline by sodium carbonate. When the combination is complete the dye is salted out, drained and dried. Its constitution in the free state may be expressed by the formula:



For the process indicated other 2-acidyl-aminophenol derivatives substituted in the 4-position may be used; for instance, 4-methyl-2-formylaminophenol.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
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Vol. X May 8, 1922 No. 10

INDUSTRIAL INSURANCE

MANAGERS of textile plants all over the country are watching with considerable interest the work of rehabilitation of men and women injured in the industries that is being done at the Reconstruction Hospital, 100th Street and Central Park West, New York City. It has long been a problem vitally affecting industry in general to find some way of bringing a worker, after an accident in a mill, back to a condition where he can get back to his job quickly and with the least possible chance of permanent disability. The discoveries and training of war days in rapid re-education and rehabilitation have been made a part of the work at this hospital and, with an eye to the general benefit to industry, governmental agencies are urging the establishment of similar hospitals all over the country with the Reconstruction as a model.

Here is used every known kind of device, electrical, water and mechanical, for quickly bringing back to normal stiffened joints, partially paralyzed nerves and muscles out of control either from injury or disuse. A particularly interesting and valuable part of the cure is the use of what is called "occupational therapy" or the use of cheering and simple kinds of work to keep the mind of the patient from fretting and so retarding his recovery.

Any day one can see at the hospital men and women of all ages with little weaving looms on their knees working away with bright yarns at all sorts of things: bath rugs, baby blankets, table covers, scarfs, belts, tapestry, pillow tops and what not. The surgeons say that the physical effect of the relaxation and the constant repetition of similar movements has a soothing effect to some extent, but the real value is in that the patient has something besides four blank walls to look at; something waiting to be accomplished when he wakes up every morning; something to be proud of when finished, and, inasmuch as the hospital buys all he makes, something to create a little earning capacity as well.

The working of a little hand loom is anything but burdensome. It is creative and interesting. All sorts of textiles are used, and bright colors help to tone up the dulness of convalescence.

Men from every industrial State this side of the Mississippi are being sent to the Reconstruction Hospital after accidental injuries received in their industries, and are being put back on the job again in from one-third to one-half the time they would otherwise need. They travel sometimes long distances for this service, because they know that they will have at their disposal expert surgical and medical advice for diagnosis and treatment, every kind of helpful electric treatment that has ever been invented, the advantage of hot, cold and pressure water devices, some of them marvelous in their power to subdue pain and give soothing massage to deep-seated muscles, and a gymnasium of contrivances, each with its dial and pointer, that makes the re-education of a muscle, nerve or joint into a sort of a game, as well as assisting toward perfectly accurate diagnosis by the surgeons.

The Reconstruction Hospital has a staff especially trained in this sort of work and a corps of nurses that have added to their usual hospital training a vast amount of technical experience in the use of water, electricity, massage and mechanics to bring back lost powers and normal activity quickly and with the least possible pain.

There is in course of erection now a new eleven-story addition to the hospital, which will more than triple the hospital's capacity. With its erection, there will be space for special laboratories to study and a ward to care for men suffering from obscure diseases caused by industrial poisons of various sorts. There is at present no hospital specializing nationally in the study and care of industrial poison cases. With the taking over of more and more of the German dye industry in this country, it is believed that even the present urgent need will be materially increased. It is regarded as of particular importance to the manufacturers and dyers of fabrics that they have the service of such a hospital so as to detect the effects of poisoning in its early stages and prevent skilled workmen from being permanently disabled.

To workers in the textile industry this new movement for more hospitals specializing in the care of industrial injuries should have a peculiar appeal. It is the feeling generally that any instrumentality that prevents the worker from losing step in the onward moving procession of industrial life is something that benefits him not alone but also his trade and the industry in which he works.

PLENTY OF "WORLDS TO CONQUER" FOR CHEMISTRY STUDENT

Dr. Bancroft Outlines Problems Awaiting Solution by Research Workers

"The student who wishes to take research work either in pure or applied chemistry can find innumerable problems in every field and of any degree of complexity and importance, from work that can be done by an undergraduate to work that no one sees how to do at present," says

Dr. Wilder D. Bancroft, War Memorial Professor of Chemistry, Cornell University, in a recent issue of the "Journal of Industral and Engineering Chemistry."

It is quite generally admitted that future progress in invention lies in the field of chemistry, and Dr. Bancroft goes into some of the details concerning problems that await solution.

"If our present civilization is to pull through," he writes, "the scientific man must speed up production of crops and goods so that the masses of the people can live decently. While everybody will have to help in this, the bulk of the strain will come on the chemist and he must be prepared to met it. We appreciate already the importance of nitrogen fixation and of getting potash from feldspar.

"The whole question of the better utilization of our petroleum resources is a vital one. Fortunately this has been realized by the oil producers and consumers, and Dr. Van H. Manning, formerly Director of the United States Bureau of Mines, has been appointed Director of Research of the American Petroleum Institute, which means that this work will be pushed as rapidly as possible. The American Institute of Baking is trying to improve the quality and keeping power of bread. The use of flotation processes has made it possible to work ore deposits which otherwise could not be handled profitably. The statement has been made that sixty million tons of ore are treated annually by these processes in the United States."

"While this is very gratifying, we apparently have no realization as yet of the possible future applications of these processes.

"When we consider ceramics, rubber and other plastics, paints, varnishes, leather, dyeing and printing, cellulose, cellulose nitrates and acetates, photography, etc., all subjects involving a large amount of colloid chemistry, we find that the industries concerned have a vast amount of empirical information as to what happens and know practically nothing about why it happens. The silicate industries are avowedly empirical, and so is the dyeing industry.

"The rubber industry knows practically nothing about the theory of vulcanization, to take a single illustration. So far as can be learned the people in the cellulose nitrate industry do not even know how many cellulose nitrates there are or what their real properties are. The photographic industry has only empirical knowledge in regard to emulsions and has no adequate theory in regard to photographic developers. The recent work of Dr. Wilson on quebracho and gambier and on the analysis of tannin, brings out clearly some of the important things which had been overlooked by the leather industry. All these industries will eventually be put on a sound scientific basis and this work will have to be done by chemists.

"The general position of the chemist is better since an appreciation of the importance of chemistry has been generally realized by the public. Some of the universities have already put their professors of chemistry on a special basis and the others will have to follow suit if they hope to fill vacancies with good men. There used to be very few research fellowships for men who had received their doctor's degree, but now we have the National Research Council Fellowship in Physics and Chemistry, which are open only to applicants who have received the doctor's degree or its equivalent. Some of the universities have similar research fellowships. The du Pont Company is giving a number of unrestricted fellowships open to graduate students, and other companies are doing likewise, though not to such an extent."

NATIONAL ANILINE & CHEMICAL COMPANY MOVES TO NEW HOME MAY 15; ANNOUNCES "KNIT GOODS MANUAL" DYER'S PERCENTAGE TABLES, AND MANY NEW COLORS

Announcement has been made by the National Aniline & Chemical Company, Inc., to the effect that after May 15 the headquarters of this concern in New York City will be located at 40 Rector Street, instead of at 21 Burling Slip. This will provide the company with better facilities for handling its business than is at present the case, and the move will mean a more efficient service for consumers.

Dyer's Percentage Tables

An extremely handy and useful device which is being issued as part of the company's service is a durable, acid-proof card containing the dyer's percentage tables which is designed to be hung in the dyehouse and to provide the practical dyer with a convenient method of converting percentages of dyestuffs into avoirdupois. The tables are divided into four columns, the percentage column reading from 10 per cent down to 0.01 per cent, and the corresponding avoirdupois columns are headed, respectively, 10 pounds, 50 pounds and 100 pounds. In this way a very extensive range can be secured; as, for instance, if 60 pounds of material is to be dyed with 1.69 per cent of color, the procedure would be as follows: In proper columns, find the percentages of color for 10 pounds and 50 pounds respectively in the 1 per cent column, and the sum of these would give the correct amount for 60 pounds of material to be dyed with 1 per cent of color. Then, find respectively the percentages of color for 10 and 50 pounds of material with 0.69 per cent of color; and the sum of these and the former quantity would give 1 pound 99 grams for 60 pounds of material to be dyed with 1.69 per cent of color. Other combinations may be calculated with equal facility, and the tables should prove a ready time-saver to the busy dyer.

National Knit Goods Manual, Second Edition

The company has recently issued a second revised edition of its "Manual of Hosiery and Knit Goods Dyeing." This little booklet has met with such general interest and approval that the first edition was very quickly exhausted.

The printing of a second edition afforded an opportunity of going over the subject matter thoroughly and of embodying certain improvements which seemed to be advisable.

The order in which the different phases of the subject are treated remains essentially the same as in the previous edition, and included in this are a number of dyeing processes of great importance to the hosiery dyer.

Stress is again laid on the fact that no attempt has been made to produce a comprehensive manual of dyeing, and the purpose has been simply to place in the hands of practical men definite information about "National" products which may be of service in the practice of modern hosiery dyehouses.

Special chapters are devoted to monotone shades, natural and artificial silk, mercerized cotton and also to heather effects and tricolette, and a final chapter is given on the very important subject of water in the dyehouse.

This booklet will be distributed upon application to the main office of the National Aniline & Chemical Company, Inc., at its new address, 40 Rector Street, or by any of the branch offices.

New National Dyes

The company has just added National Erie Scarlet B, National Erie Brown 3GN and National Erie Brown 3GN Conc. to its line of direct dyes.

National Erie Scarlet B is identical with the pre-war type Diamine Scarlet B. In addition to dyeing cotton, it is found valuable for the dyeing of union goods, as it produces reds of excellent fastness to rubbing and good fastness to water and washing on both wool and silk. This dye is also extensively used for the printing of wool and silk, for which purpose it is particularly adapted because of its brilliant shade and good fastness to light and water.

By virtue of its special properties National Erie Brown 3GN takes an important place in the National's extensive line of Direct Browns.

Its perfect solubility, even in calcareous watre, recommends its use in mills having hard or variable water. This advantage, together with its level dyeing properties, makes it very useful for machine dyeing.

National Erie Brown 3GN has good affinity for vegetable fibers in a cold bath, and is especially recommended for all cases where the material suffers when dyed at the boil. It finds extensive use for the dyeing of artificial silk, linen, straw and paper, and is particularly recommended for the dyeing of unions, as it dyes silk and wool approximately the same shade as cotton.

The branch offices of the company will gladly furnish dyeings and product samples.

New Dye Plants Organized in Italy

Increasing Tendency to Avoid Specialization on Finished Products Is Shown—Heavy Rainfalls Relieve Shortage of Electric Power—German and Italian Delegates Meet to Overcome Trade Obstacles—Large Stocks of Reparation Colors Still on Hand

By RAFFAELE SANSONE

Genoa, April 7.
Special to The Reporter.

LARGE quantities of war reparation dyes remained in the reserve stocks during the last five weeks, although the national demand for basic colors and colors for cotton dyeing was still very fair, owing to many cotton works operating on full time because of increased exportations. Special efforts were therefore made to increase the sale of such products abroad, and to take advantage of the increased value of the Italian lira—which increased value, however, was destined not to last long, owing to an early regain in the foreign exchange. This regain brought the value of the United States dollar from 18.50 lire to 19.50 lire, and the value of the English pound from 82.50 lire to 83.50 lire.

Organization of New Dye Works Continues

Although the results obtained by the Italian coal-tar color works had not met the same success as was the case in some other branches of the Italian chemical industry, the creation of new firms continued, and one of these, in Turin (Belotti e C.), has a capital of 1,700,000 lire. In this instance, however, a change in the old policy of placing all eggs in one basket is noted; for the new works, besides producing intermediates and coal-tar dyes, also produce chemicals, thus being in a position, if well directed, to make a dividend in one way or another.

The Societa Generale dei Colori, of Milan, having a capital of 5,000,000 lire, of which 2,500,000 lire is invested, has organized the sale of mineral colors and is studying the installation of an Italian works.

A meeting was arranged between Italian and German delegates for promoting arrangements to facilitate and encourage a greater exchange of products between the two countries. Although at the time of writing nothing decisive had been done, special studies were being made for the gradual elimination of the difficulties still existing in the commercial relations of these countries. It is believed that this can be accomplished because the principal Italian products are those of the soil, whereas Germany specializes, as usual, on dyestuffs, pharmaceutical products, chemicals, machinery, etc.

The Italian coloring matter works benefited during April by a more plentiful supply of electric power, which heavy rain and snow falls served to increase by augmenting the available water-power. In addition, cheaper coal and raw materials, produced by the lowering of foreign exchange of the past month, likewise aided the industry.

Prices of Coal-Tar Dyes

The quotations of war reparation dyes in Table I, per ton in lire and dollars, shows the great difference brought about by the lower United States exchange (19.50 lire) prevailing at the moment of writing, in comparison with the March prices.

Mordants, Assistants, Dyehouse Products

The demand for mordants, assistants and other products was greatest on the part of cotton dye works, wool-treating concerns passing few orders through the unfavorable season. Some of the lire and dollar quotations are given, per ton at Milan, in Table II.

TABLE I

	Mar. 7 to Apr. 7 (lire)	March 7 (dollars)	April 7 (dollars)
Naphthol Yellow	50,000— 70,000	2,702—3,783	2,563—3,589
Auramine	70,000— 80,000	3,783—4,324	3,589—4,102
Orange II	30,000— 35,000	1,621—1,891	1,537—1,794
Nigrosine, water soluble	30,000— 40,000	1,621—2,162	1,537—2,051
Nigrosine, soluble in alcohol	35,000— 40,000	1,891—2,162	1,794—2,051
Sulphur Black	7,000— 10,000	378— 540	359— 512
Acid Black	35,000— 40,000	1,891—2,162	1,794—2,051
Direct Black	35,000— 40,000	1,891—2,162	1,794—2,051
Chrome Black	40,000— 45,000	2,162—2,432	2,051—2,307
Methylene Blue	80,000—100,000	4,324—5,405	4,102—5,126
Direct Blue	25,000— 30,000	1,351—1,621	1,281—1,537
Sulphur Blue	45,000— 50,000	2,432—2,702	2,307—2,563
Malachite Green	80,000—100,000	4,324—5,405	4,102—5,126
Acid Green	60,000— 70,000	3,243—3,783	3,076—3,589
Direct Green	50,000— 70,000	2,702—3,783	2,563—3,589
Bismarck Brown	40,000— 50,000	2,162—2,702	2,051—2,563
Magenta (Fuchsine) Crystals	70,000— 80,000	3,783—4,324	3,589—4,102
Eosine	60,000— 80,000	3,243—4,324	3,076—4,102
Ponceaux	35,000— 45,000	1,891—2,432	1,794—2,302
Methyl Violet	70,000— 80,000	3,783—4,324	3,589—4,102

TABLE II

	April 7 (lire)	April 7 (dollars)		April 7 (lire)	April 7 (dollars)
Acetate of alumina	1,600	82	Bisulphite of soda, 32 deg. Be.	400	20
Chrome alum	3,000	153	Chlorate of potash	3,100	159
Bichromate of potash	6,000	307	Chloride of ammonia	5,000	256
Ferrous sulphate	500	25	Bleaching powder	900	46
Copper sulphate	2,250	115	Nitrite of soda	3,100	159
Tartar emetic	12,000	614	Yellow prussiate of potash	13,000	666
Aniline oil	10,000	512	Yellow prussiate of soda	9,000	461
White refined glycerine	9,000	461	Caustic soda, 70/72	2,100	107
Glucose, 45 deg. Be	3,600	184	Silicate of soda, 140 deg. Tw	1,000	51
Hydrogen peroxide	2,100	107	Sodium sulphide	2,600	133
Tannic acid, 60 per cent	20,000	1,024	Logwood extract	10,000	512
Tartaric acid, crystals	10,750	551	Yellow dextrine	3,500	179
Acetic acid, 30 per cent	2,800	143	White dextrine	3,800	195
Hydrochloric acid, 20-21 deg. Be.	300	15	Farina	3,250	161
Formic acid	11,000	564	Kordofan gum	4,900	251
Lactic acid, 80 per cent	4,000	205	Indigo, 25 per cent	22,000	1,128
Alum	1,000	51	Beta-naphthol	18,000	923
Ammonia, 22 deg. Be	1,450	74	Industrial castor oil	5,000	256

INQUIRY DEPARTMENT

All classes of chemical work or advice relating to artificial colors, natural dyestuffs, dyewoods, raw materials, extracts, intermediates, crudes, or dyeing chemicals and accessories in general, will be carried out for readers and subscribers of the AMERICAN DYESTUFF REPORTER by this department.

Inquiries of a minor character will be answered on this page, while major matters involving personal investigation, analyses, perfected processes and working formulas, will, if desired, be treated confidentially through the mails. In answering inquiries which, by their nature, require reference to the products, processes or apparatus of some particular manufacturer we aim to be absolutely impartial. We refer the inquiries to specialists whom we believe to be best qualified to answer them intelligently, and must disclaim responsibility if their reports show unintentional bias. All questions, materials for analysis or letters leading to the opening of negotiations for special work will receive prompt attention if addressed to Inquiry Department, American Dyestuff Reporter, Woolworth Building, New York City.

D. R. O.—*Question:* We require dyes for cotton which will stand a weak chlorine bleach such as is given by laundries. Are there any colors except vat dyes and Turkey Red which may be used?

Answer: There is no other class of dyes we could recommend, as sulphur, direct and developed colors are all generally sensitive to a greater or lesser degree. There are two exceptions—Stilbene Yellows, which have been chlorinated in course of manufacture, and Primuline, diazotized and developed with hypochlorite. Of course, you may obtain some direct dyes which will resist for a short time, but a regular laundry bleach at frequent intervals will bleach them sooner or later.

A. C.—*Question:* How do dyers make up the "lime pots" they use for cleaning their hands?

Answer: A very satisfactory lime pot may be made by melting 10 pounds of sal-soda crystals in an iron pot by means of heat, without adding water. When it is just melted stir in 5 pounds of fresh bleaching lime. Continue stirring until every lump has disappeared and the mass is smooth and white. On cooling, it generally turns pink, due to the formation of sodium ferrate. The mass is used without water and rubbed well over the hands, but should not be used on the tender skin of the forearm. Then rinse off well with water. This leaves the skin feeling unpleasantly slippery and smelling of chlorine, with a great tendency to perspire. To remove these effects, wash again in bisulphite of soda, then in water, and the skin will be absolutely clean and also antiseptic. No bad effects will follow.

B. H. A.—*Question:* We have been using a sulphonated oil as a fat liquor for leather, but find that it strips colors made with acid dyes. We know of others using such oils with great success. Can you tell us what may be the cause of the trouble?

Answer: The only reason we can see for such behavior on the part of the fat liquor is that you are probably using a neutralized oil, which is actually a soap. When a sulphonated oil is used for fat-liquoring it should be the free acid oil without any added soda or ammonia. The free acid will make a milky emulsion in warm water, but the neutralized oil dissolves clear. You may test the product you are using and if it dissolves clear simply add a small quantity of any acid to free it from the alkali, and it will then make an emulsion which will not strip the colors.

E. T. M.—*Question:* How is methyl violet prepared so it may be ground in castor oil for the manufacture of copying typewriter ribbons?

Answer: Ordinary methyl violet will not grind well, but will always form hard gummy masses. The proper material to use is Crystal Violet 6B, which powders easily and does not gum. The grinding may be done in an ordinary paint mill.

J. S.—*Question:* What material is used to make the paint material known as Para toner?

Answer: Para toner is the trade name for the precipitate formed by the coupling of beta-naphthol with diazotized meta-nitroparatoluidine, also known as MNPT. No mineral base is used, the organic compound forming the entire product.

CAMPBELL ISSUES BULLETINS ON WOOL BLACKS AND AUTOCHROME GREEN BB

John Campbell & Co., 75 Hudson Street, New York City, have issued two bulletins to the trade descriptive of a diversified range of Wool Blacks and Autochrome Green BB, and which contain dyed samples and methods of application.

The Wool Blacks described include the company's Aceko Black NBB and Aceko Black 10B High Conc., which types are blue blacks particularly well adapted for the printing of tapestry yarns, as Navy Blues for silk skeins and for shading Navy Blues on all-wool dress goods dyed in the piece, as well as wool hosiery and the production of blue blacks dyed in self-colors or shaded with Acid Red, Orange or Yellow; and are also widely used as a neutral dyeing color. Aceko Black 10B High Conc. is the purest in shade, and represents the highest possible concentration, a standard which should be appreciated by large consumers; while Aceko Black NBB is the normal strength, otherwise corresponding to the first-mentioned. Aceko Blue Black 15B High Conc., likewise described in this bulletin, represents the bluest shade as well as the highest possible concentration, and can be applied in sulphuric acid baths. Many dress goods manufacturers make use of this product as a basis for navies dyed on carbonized goods owing to its excellent leveling properties. It is also recommended for goods difficult to penetrate, and for carpet wools, unions, silk dyeing, fur felt hats, etc.

Autochrome Green BB is a new Campbell product which will be found serviceable as a chromate color, also for vigoureux printing, as well as chrome bottom and top chrome methods. Autochrome Green BB is likewise valuable as a direct dyeing acid color and for neutral dyeing. This product possesses good fastness to light, especially in medium or deep shade, and satisfactory fastness to fulling when dyed in the presence of chrome or when after-treated; also to stoving, carbonizing, cross-dyeing and alkalies. Cotton and artificial silk threads are practically unstained. Silk is dyed to same depth as wool. Tests for fastness should be determined in each individual case. Autochrome Green BB can be used in metal dyeing machines (Franklin) without material alteration of shade.

The company likewise calls attention at this time to a new Acid Scarlet which it is manufacturing and introducing under the designation of Aceko Scarlet RRG.

Aceko Scarlet RRG is a product used by carpet mills for printing as well as for dyeing. It produces very level results, giving good body and brilliancy, and can be used in strong acid baths. This particular brand gives excellent yellow shades of scarlet with good fastness.

Aceko Brilliant Scarlet is another type of scarlet similar to Scarlet 3R and 4R, giving beautiful blue shades of scarlet. It is recommended for the dyeing of carpet yarns. It can also be used to blend Aceko Scarlet RRG.

RODNEY HUNT MACHINE CO. TO EXHIBIT AT KNITTING ARTS SHOW

The Rodney Hunt Machine Company, of Orange, Mass., will be represented at the forthcoming Knit Goods Exhibition in booths 269 and 270, the display being in charge of its Philadelphia representative, the R. C. Jefferson Company. Co-operating with the Jefferson organization, the factory textile engineers will be present to answer all questions and will assist in explaining the various features of Rodney Hunt machines.

In addition to the Philadelphia representation, the company now is represented in Chicago by R. R. Street & Co., Inc., 28 North Clinton Street; in Charlotte, N. C., by H. G. Mayer, Realty Building, and in Canada by W. J. Westaway & Co., Ltd. A. W. Buhlmann, 200 Fifth Avenue, New York City, is the foreign representative of this long-established company.

The "Rodney Hunt" line of wet finishing machines, including fulling mills, washers, reel machines (for dyeing, bleaching and scouring), warp dyeing machines, etc., is being marketed throughout the country as highly developed products. Attractive catalogues are available for any mill.

"Rodney Hunt" service wood rolls are being used very successfully by an increasing number of mills, and with facilities for manufacturing all sizes and types of rolls, from the very smallest to the largest, this branch of the business has been growing rapidly during the past year or two. Rodney Hunt rolls are used not only in all branches of the textile industry but also in paper mills.

DU PONT ANNOUNCES PONTACHROME BLACK F, PONTACHROME VIOLET SW, AND MILLING SCARLET O

Recent announcements of the Dyestuffs Sales Department, E. I. du Pont de Nemours & Co., from the New York City sales office at 8 Thomas Street, include descriptions of Pontachrome Black F, Pontachrome Violet SW, and a Milling Scarlet as colors now being marketed.

Pontachrome Black F is a chrome black in which consumers will find a color that has very excellent qualities and which is adaptable for producing deep jet blacks for a special use in the men's wear trade, where its fastness properties will meet all the usual requirements. Fine grays are obtained by the use of this product in light dyeings which are easily applied by the chromate method.

Pontachrome Violet SW is a color which will work by either the top, bottom or chromate methods. It also is especially adaptable to the men's wear trade, and also has the property of leaving both cotton and silk effect threads unstained. It is a very level dyeing product and extremely adaptable for combination shades.

The Milling Scarlet being offered by the company is marketed under the name of Du Pont Milling Scarlet O, and is a product which is characterized by brilliancy of shade and especially recommended for knitting yarns, flannels, blankets, etc. This color can be treated with chrome, and the shade becomes slightly bluer; but it will be much faster to milling and to light.

SEYDEL-NITRO MERGER

Formal announcement is made under date of May 1, 1922, by the Seydel Manufacturing Company, of Jersey City, and the Nitro Products Corporation, of Nitro, W. Va., that these two concerns have become merged under the name of the Seydel Chemical Company. The plants at both points mentioned will be enlarged and will concentrate on the production of "Seydel Chemicals." A metropolitan office will be maintained at 120 Broadway, New York City. The officers of the new company are: Herman Seydel, president; Paul Seydel, vice-president, and J. B. Pitcher, secretary-treasurer.

WANTED, COLORIST

Wanted by large manufacturer of dyestuffs, colorist who has had scientific training in dyestuff chemistry. Applicant should be familiar with the practical application of all kinds of dyestuffs and must be able to conduct all work necessary for the investigation of new colors. Address Box 211, American Dyestuff Reporter.

WANTED, LABORATORY MAN

Wanted by large dyestuff manufacturing concern, reliable man to take charge of routine work in dye laboratory. Applicant must be familiar with the dyeing and testing of all classes of dyestuffs, including vat colors. Man who has had practical dyeing experience is preferred Address Box 212, American Dyestuff Reporter.